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CONSTRUCTION AND EQUIPMENT

No. 81



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29 December 1982

# USSR REPORT

## CONSTRUCTION AND EQUIPMENT

No. 81

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## CONSTRUCTION PLANNING AND ECONOMICS

### EFFECTIVENESS OF CAPITAL INVESTMENTS

Moscow FINANSY SSSR in Russian No 12, Dec 81 (signed to press 13 Nov 82) pp 3-11

[Article by Deputy Chairman of the Board of the All-Union Bank for Financing Capital Investments P. D. Podshivalenko: "The Increase of the Effectiveness of Capital Investments in Light of the Decisions of the 26th CPSU Congress"]

[Text] At the 25th and 26th CPSU Congresses it was indicated that the utmost increase of the efficiency of social production and the quality of all work is the fundamental basis of modern economic development and the most important economic and political task of the present stage of the building of communism. This task was formulated very comprehensively and graphically in the report of Comrade L. I. Brezhnev at the 26th CPSU Congress: "The economy should be economical--such is the requirement of the times."<sup>1</sup> This, he stressed, is the orientation of the economic policy of the Communist Party for a long-term period. Its continuity is embodied in the Basic Directions for the 11th Five-Year Plan and the Period to 1990.

The aim at efficiency and quality implies the decisive changeover to primarily intensive factors of the development of physical production, which serves as the basis of the implementation of the large and comprehensive program of the increase of the well-being of the people, the concern about which always was, is and will be an important goal of the policy and all the practical activity of our party.

At the 26th congress Comrade L. I. Brezhnev said that the intensification of the economy and the increase of its efficiency, if what is meant is practical economic activity, consist first of all in the fact that, while committing comparatively fewer resources to production, it would be possible to obtain more. Consequently, the efficient use of labor, fixed capital, fuel and raw materials, the products of the fields and farms is a prerequisite of the progress of the socialist economy, while a practical attitude toward public property and the ability to use completely and efficiently everything that we have are the heart of party policy in this area. Scientific and technical progress, investment policy and the system of plan and reporting indicators are aimed at its solution.

The implementation of vast construction programs involves great expenditures. More than 20 percent of the national income is being allocated annually for capital investments. Amortization deductions hold a prominent place in the sources of

1. "Materialy XXVI s"yezda KPSS" [Materials of the 26th CPSU Congress], Moscow, Politizdat, 1981, p 42.

capital investments (up to 25 percent of their total amount). The results of the work of enterprises, economic, construction and other organizations, the rate of the introduction of new equipment and modern technology and production efficiency depend on how effectively these assets are spent.

The development of the socialist economy is distinguished by the continuous increase of its efficiency, which is evident from the cited data for the 10th Five-Year Plan as compared with the 9th Five-Year Plan:

	(percent)
Gross national product. . . . .	129
National income used for consumption and accumulation . . . . .	124
Output of industry. . . . .	133
Output of agriculture . . . . .	109
Capital investments . . . . .	129
Fixed capital . . . . .	128
Public consumption funds. . . . .	134

Analyzing the results of the work on the increase of the efficiency of production and its intensification, Comrade L. I. Brezhnev in his report at the 26th CPSU Congress indicated that the socioeconomic significance of what has been achieved consists in the fact "that on the basis of the steady development of the economy the entire system of social relations and our socialist way of life have continued to improve."<sup>2</sup>

In recent years the period of the construction of production facilities for the economy as a whole has been shortened somewhat. The gap between the actual and the standard periods has been decreasing noticeably. During 1966-1970 the number of projects put into operation in conformity with the norms came to 12 percent, during 1971--17 percent, during 1976-1980--approximately 30-35 percent. The growth of unfinished construction was halted. The projects of the greatest importance for the national economy are being turned over, as a rule, on time and ahead of time. The coefficient of the concentration of capital investments, which is determined by the ratio of the average standard period to the average actual period, increased from 0.67 during the 9th Five-Year Plan to 0.7 during the 10th Five-Year Plan.

The socialist economy has reserves, the mobilization of which ensures the shortening of the periods of construction. "The new five-year plan," Comrade L. I. Brezhnev pointed out at the 26th CPSU Congress, "will be a serious examination for construction workers. A characteristic trait of it is the utmost concentration of forces on the quickest possible completion and start-up of those enterprises which are capable of providing the greatest increase of output and of undoing the bottlenecks."<sup>3</sup>

The ratios which have now formed between the estimated cost of all projects under construction (it exceeds 4-5 annual plans of capital investments), the period of their construction (about 6 years with a standard period of 3.5 years) and the amount of unfinished construction (89 percent of the annual amount of capital investments instead of approximately 67 percent according to the norm) cannot be

2. "Materialy XXVI s"yezda KPSS," p 36

3. Ibid., p 39.

recognized as satisfactory. This is a result of the fact that during the 10th Five-Year Plan it was not possible to overcome the dispersal of capital investments among numerous projects and the dragging out of the placement of production facilities into operation and their assimilation. The party congress stressed the need to fight persistently against the diversion of material and manpower resources from the most important national economic construction projects, for the shortening of the periods of construction and for the limitation of the number of projects being built simultaneously. Comrade L. I. Brezhnev noted that "we must resolutely put an end to the practice of allocating capital investments and material resources to some regions or others solely because established construction organizations exist there. Moreover, the network of these organizations and bases of the construction industry should be determined by the expanding geography of our new construction projects."<sup>4</sup>

During 1976-1980 the increase of the estimated cost exceeded 50 billion rubles. As a result of the formed situation the annual increase of capital investments to a considerable extent is going for the reimbursement of the difference in the estimated cost, which is creating a shortage of resources for the fulfillment of the start-up program. Meanwhile, according to the estimates of USSR Gosplan, with the shortening of the construction periods by just 1 year society receives an additional 10 billion rubles of national income.

The Communist Party of the Soviet Union has posed the task of the efficient and economical use of capital investments, with the maximum result and gain in time. The essence of the problem, Comrade L. I. Brezhnev points out, consists in achieving a substantial increase of the volume of production and the national income for each unit of labor, material and financial expenditures.

During the 11th Five-Year Plan the productivity of national labor is to increase by 17-20 percent, by means of this not less than 85-90 percent of the increase of the national income, more than 90 percent of the increase of the production volume in industry and nearly 100 percent in agriculture and rail transportation are to be provided. At the same time the growth rate of capital investments has been set at the level of approximately 10 percent. For the first time in planning practice the increase of the national income should exceed the increase of capital investments. Consequently, rigid demands with respect to the expenditures on the reproduction of the fixed capital of our country are envisaged.

As a whole the construction industry usually fulfills the plans of contracting work, while the assignments of the start-up program with respect to many sectors are upset. For overcoming this gap it is necessary during the current five-year plan to solve more completely the problem of the introduction in the sectors of the achievements of technical progress and advanced methods of the organization of production and labor, the improvement of the management and organizational forms of construction, the universal dissemination of the brigade contract and the increase of economic and moral stimulation. Labor productivity in construction should increase by 15-17 percent. Real possibilities exist for this. More than 570,000 basic construction machines are in operation at construction projects. More than 40 percent of the total amount of construction and installation work is being performed with prefabricated large-size components.

4. "Materialy XXVI s"yezda KPSS," p 120.

The decisions of the 26th CPSU Congress indicate the ways and means of increasing the effectiveness of capital investments. They must be allocated primarily for the retooling and renovation of operating enterprises. The expenditures for these purposes are recovered on the average threefold more rapidly than those for new construction, the need for manpower decreases. It is necessary to increase the proportion of the capital investments being used for the creation of the active portion of the productive capital (equipment, machinery, devices) and to expedite its replacement on a modern scientific and technical basis. When determining the limits of capital investments priority should be given to the accomplishment of the most important economic, scientific, technical and social tasks, the fulfillment of which depends on the base sectors of industry--the electric power sectors, metallurgy, the chemical industry, machine building.

The effectiveness of capital investments to a considerable extent is determined by the efficient distribution of productive forces. When working on the questions of the construction of new enterprises it is necessary to take properly into account the availability in the given region of raw materials, power and manpower resources, to provide for the complete utilization of natural resources and to ensure the proximity of power-consuming and materials-consuming works to the sites of the extraction of fuel and other minerals.

The formation of territorial production complexes in the European part of the RSFSR, in the Urals, Siberia, the Far East, Kazakhstan and Tajikistan is being continued in conformity with the decisions of the 26th CPSU Congress. During the years of the 10th Five-Year Plan these complexes provided the entire all-union increase of petroleum, gas and coal. In the northwestern part of Siberia in 1970 the production of petroleum (including gas condensate) came to 31 million tons, while in 1980 it exceeded 312 million tons, the production of gas during this period increased from 9.5 to 156 billion m<sup>3</sup>. The Orenburg gas industry workers are now providing more than 48 billion m<sup>3</sup> of gas. The miners of the Pavlodar-Ekibastuz Complex in 1980 mined about 67 million tons of coal--nearly threefold more than in 1970. The Sayansk, Bratsk-Ust-Ilimsk, Southern Yakutsk, Karatau-Dzhambul, Mangyshlak and Southern Tajik territorial production complexes are playing an increasing role in the economy of the Asian part of the country. The Baykal-Amur Railway Line is affording great opportunities for progress to the east and north.

Thus, the eastern regions--Siberia, the Far East, Kazakhstan, Central Asia--are being transformed more and more into regions of the most important sectors of industry, first of all power-consuming works. The Basic Directions envisage to henceforth continue the work on the commitment to the economic turnover of the fuel, energy and mineral raw material resources of the eastern and northern regions.

The timely and complete supply of construction with highly efficient equipment, materials and the other equipment stipulated in the plans is of great importance for shortening the construction periods. In conformity with the decree of the CPSU Central Committee and the USSR Council of Ministers on questions of the improvement of planning and the economic mechanism the USSR ministries and departments and the councils of ministers of the union republics are obliged to design and construct new enterprises and to expand and renovate operating enterprises on the basis of a highly efficient production technology and the use of new equipment, which ensure at the capacities being newly put into operation the output of products which in their technical level and quality would conform to the best domestic and foreign models or would surpass them.

An increase of the output of machine building by not less than 1.4-fold is planned during the 11th Five-Year Plan. The rate of the updating of equipment will be sped up by approximately 1.5-fold. The production of power, heavy, transport, chemical, petroleum and agricultural machine building, machine tool building, instrument making, the electrical equipment industry and machine building for light and food industry will increase.

Capital construction is one of the materials-consuming sectors of the national economy. In the total value of construction and installation work the material expenditures make up approximately 60 percent and, with allowance made for the expenditures on mechanization, even more. In our country about one-fourth of the produced rolled metal products, one-fifth of the commercial lumber, 80 percent of the cement, 90 percent of the soft roofing material, nearly one-half of the window glass and many millions of cubic meters of the nonmetallic materials: sand, crushed rock, gravel and others, are used annually for capital construction. If we take a program of construction work for a year in the amount of 60 billion rubles, the expenditures on materials, power and fuel in this program will amount to an impressive figure--36 billion rubles, while just a 1-percent saving on these expenditures would amount to 360 million rubles.

The need to implement even more persistently the principles of socialist management and to fulfill Lenin's order--to count money carefully and conscientiously, to manage economically and to observe the strictest discipline in labor--is pointed out in the decree of the CPSU Central Committee and the USSR Council of Ministers "On Stepping Up the Work on the Economy and Efficient Use of Raw Material, Fuel, Energy and Other Material Resources," which was adopted in 1981.

The change of the direct of capital investments is contributing to the decrease of the materials-output ratio. For example, during the past five-year plan our country built a number of nuclear electric power stations, first of all in the European part of the country. The development of nuclear power engineering will decrease, and, moreover, considerably, the material expenditures on the development of the coal industry.

One should not, moreover, overlook the advantages of the placement of equipment outdoors or its installation under light-weight hip roofs. But the appropriate equipment in the necessary amounts does not yet exist for this. Machine building enterprises are obligated to devote more attention to the designing and expansion of the production of machines which are capable of operating under such conditions.

The improvement of the design decisions is changing the demands on material resources. The construction components, semimanufactures and items should be light-weight, inexpensive, without unnecessary safety margins, interchangeable and, if necessary, dismountable for use at other projects. Technical progress, therefore, in many instances is making unnecessary the heavy products made from concrete and reinforced concrete, metal and stone and is placing in the forefront other construction materials, which meet the new requirements and are produced on the same basis and on the basis of chemistry, particularly plastics.

Estimates show that the rationalization of the structure and quality of construction materials makes it possible to decrease their weight per unit of work by approximately 25-30 percent and, consequently, to reduce the weight of buildings. This

is a very rough estimate. But it is also evident from it, what advantage the country can obtain, for the reduction of the weight of materials per unit of work even on such a scale will substantially affect the periods, the labor intensity and the cost of construction. The reduction of the weight of buildings in turn ensures the utmost mechanization of construction work, the improvement and the decrease of the cost of the pool of construction machines and devices.

The decrease of the transportation costs also has a direct bearing on the decrease of capital investments, primarily due to the cost of materials. Thus, in the final cost of cement these expenses amount to 14.4 percent, wall materials--30.1 percent, sand and other nonmetallic materials--more than 70 percent. The average distance of the transportation of wall materials in 1978 was equal to 731 km, while in 1979 it was 751 km, brick--352 and 364 km, precast reinforced concrete structural components--679 and 727 km. There are also inefficient shipments. The departmental isolation of many enterprises, which produce similar products, is one of the causes of their occurrence. The efficient distribution of productive forces, the elaboration of the optimum arrangements of freight flows and the use of internal reserves are a means of solving this problem. In construction, in particular, the formed arrangement of the transportation of local construction materials must be reorganized immediately.

As in industry, long-term standards for the decisive indicators of the activity of construction organizations, for the distribution of the profit and the formation of economic stimulation funds, and the procedure and amounts of the collection of the fee for productive capital and other tools, which actively influence the fulfillment of the quantitative and qualitative assignments of the plan, are being used in construction. Here it has been established that in construction the placement of capacities and projects into operation and the fulfillment of the plan on the commodity construction production and the assignments on labor productivity and the profitability of production are the basic evaluation indicators of the work of contracting organizations.

During the years of the 10th Five-Year Plan the All-Union Bank for Financing Capital Investments and its institutions performed work on the improvement of the financing of capital investments, the extension of credit to contracting organizations and construction projects and settlements in construction, organizing it so as to promote to the maximum extent the increase of the effectiveness of capital investments and construction work. In 1980 a check of the effectiveness of the capital investments, which were being allocated for the retooling and renovation of operating enterprises, was organized with respect to a number of most important industrial ministries--the USSR Ministry of Ferrous Metallurgy, the Ministry of Heavy and Transport Machine Building, the Ministry of Machine Building for Light and Food Industry and Household Appliances, the USSR Ministry of the Construction Materials Industry, the Ministry of the Pulp and Paper Industry and the USSR Ministry of Light Industry.

The economic effectiveness of the capital investments was analyzed by individual sectors and subsectors of industry and by types of production. In particular, such a study was conducted with respect to enterprises of the Ministry of Ferrous Metallurgy and the Ministry of Nonferrous Metallurgy, which are engaged in the processing of scraps of ferrous and nonferrous metals; mining enterprises of nonferrous metallurgy; enterprises which produce wood particle and fiber boards;

enterprises of large-panel housing construction and prefabricated house building and others.

The materials of the analysis of the economic effectiveness of the capital investments served as the basis for the preparation of suggestions on the draft of the State Plan of USSR Economic and Social Development for 1981.

The check of the effectiveness of capital investments was also made for individual construction projects. It is possible to cite the following fact. The analysis of the correctness of the location, designing and construction of the Karatau Phosphorus Plant of Mineral Fertilizers established that the errors in the designing of the plant led to the formation of unproductive expenditures in the amount of more than 10 million rubles. At the suggestion of the bank the construction of the plant was halted.

Taking into account the great importance of the development of territorial production complexes for the implementation of the plans of the economic and social development of the country, the All-Union Bank for Financing Capital Investments studied the means of expediting the construction of the enterprises and facilities, which are a part of the West Siberian, Pavlodar-Ekibastuz, Karatau-Dzhambul, Mangyshlak and Kansk-Achinsk territorial production complexes, as well as the effectiveness of the use of the capital investments being allocated for the development of a number of large industrial centers.

The increasing of the attention of ministries, departments and planning, financial and banking organs to the questions of the increase of the effectiveness of capital investments contributed to the improvement of the work on the placement of fixed capital into operation, the number of projects being built simultaneously decreased.

The reproductive and technological structure of capital investments was improved somewhat. For the construction projects financed by the All-Union Bank for Financing Capital Investments the proportion of the expenditures on the renovation and retooling of operating enterprises in the total amount of capital investments for production purposes (excluding the expenditures on planning and surveying work of future years and on equipment not included in the estimates for construction) had increased in 1980 as against 1979 from 28.3 to 29.4 percent, while the proportion of new construction decreased from 39.9 to 38.3 percent.

In accordance with the suggestions of the All-Union Bank for Financing Capital Investments, for various reasons 6,922 construction projects and facilities were excluded from the plans of capital construction and the title and intraproject title lists for 1980, including 2,364 newly begun ones in the amount of 215 million rubles in connection with the allocation of capital investments with a violation of the norms of the construction periods, 2,875 newly begun construction projects and facilities in the amount of 362 million rubles as a result of the inadequate allocation of capital investments for start-up and transitional construction projects and facilities.

On the suggestions of the institutions of the bank the amounts of capital investments for 2,663 start-up construction projects and 347 construction projects, for which equipment had already been imported, were increased respectively by 846.6 million rubles and 110 million rubles by means of the released assets. The

implementation of the suggestions made by the bank made it possible to increase the placement of fixed capital into operation with respect to 2,986 construction projects.

The economic influence of the bank on clients and contractors for the purpose of ensuring the fulfillment of the start-up program increased. Credit for the exceeding of the plan in the amount of 687.5 million rubles was granted to the construction projects, which had successfully fulfilled the annual assignments on the placement of fixed capital, production capacities and projects into operation and had fulfilled the annual plan of capital investments and construction and installation work without detriment to the start-up construction projects. This made it possible at individual enterprises to ensure the additional placement of capacities and fixed capital into operation. Among them are the Severnyy Mining and Concentration Combine of the USSR Ministry of Ferrous Metallurgy, at which capacities for 3 million tons of pellets and 845,000 tons of concentrate were put into operation by the attraction of credit for the exceeding of the plan, the Altayskiy Motor and Tractor Plants of the Ministry of Tractor and Agricultural Machine Building, at which an additional 7.5 million rubles of fixed capital were put into operations, and the Plant of Automobile and Tractor Electrical Equipment in Borisovo of the Ministry of the Automotive Industry--800,000 rubles and others.

Measures of financial and credit influence, which in a number of instances yielded positive results, were applied to contracting organizations, which were not fulfilling the assignments on start-up projects and were diverting assets for secondary projects. The RSFSR office in 1980 imposed sanctions for the upsetting of the start-up program on 335 contracting organizations, the Ukrainian office--118 organizations, the Kazakh office--118, the Moldavian office--51 and the Tajik office--41 organizations. The checking of the quality of the estimates and the study of the technical and economic indicators of construction projects at the stage of designing and construction was expanded. As a result during the past five-year plan the estimated cost of construction was reduced by nearly 9 billion rubles. The analysis of the design decisions made it possible to make suggestions on the decrease of the consumption of metal. During the past 5 years in accordance with the suggestions of the bank 692,000 tons of metal have been saved.

Having examined the report of the All-Union Bank for Financing Capital Investments on the results of the activity for 1980, the USSR Council of Ministers noted that the bank had implemented a number of measures on the improvement of the financing of and the extension of credit for capital investments and on the increase of the level of economic and engineering supervision work. The preliminary work connected with the changeover of contracting organizations to the extension of credit for expenditures for the incomplete performance of construction and installation work, was completed to execute the decree of the CPSU Central Committee and the USSR Council of Ministers on the further improvement of the economic mechanism. The monitoring of the implementation by ministries and departments of measures on the concentration of capital investments was improved.

The Council of Ministers also indicated individual shortcomings in the work of the bank on the monitoring of the timely placement of enterprises and projects into operation, the decrease of the stocks of uninstalled equipment, the observance of planning discipline and the economical consumption by construction organizations of material resources and wage funds. Bank credit is still not influencing

effectively enough the shortening of the periods of the construction of projects and the acceleration of the placement of production capacities into operation. At the 26th CPSU Congress Comrade L. I. Brezhnev stressed that the proper economic situation and organizing and administrative relations should be created for the accomplishment of the tasks facing the country, which found reflection in the subsequent decrees of the CPSU Central Committee and the USSR Council of Ministers.

The Board of the All-Union Bank for Financing Capital Investments, having examined the tasks of the system of the bank in light of the decisions of the 26th CPSU Congress, elaborated specific measures on their accomplishment. It is envisaged to tighten up the monitoring of the increase of the effectiveness of capital investments and work quality, the fulfillment of the assignments on the placement of capacities, fixed capital and construction projects into operation, the increase of the efficiency and quality of the work with contracting organizations and the improvement of the checking of planning and estimate discipline in construction and the quality of estimate documents. To ensure the more complete mobilization of the assets, which are intended for the financing of and extension of credit for capital investments, the increase of the effectiveness of the extension of credit to construction projects, contracting and other organizations. To increase the level of the ideological and political work with personnel, to improve the qualitative composition of the staff, to improve the organization of economic education, the training and further training of personnel, to ensure the introduction of advanced technology and the performance of bank operations on the basis of the use of modern computer and organizational technology.

The first practical results of the implementation of the outlined measures already exist. As a result of the check of the plans and title lists of capital construction for 1981 the number of newly begun construction projects for production purposes as compared with 1980 was decreased by 20 percent for projects with an estimated cost of 3 million rubles and more and by 26 percent for the others. Of the construction projects accepted for financing, 60 percent are start-up projects or are connected with the renovation and retooling of operating enterprises, the production of consumer goods and the service of the population.

At the same time for many construction projects (1,242), which were carried over from last year, more than 6 billion rubles of capital investments failed to be turned over--more than 51 percent as against the amounts outlined by the title lists for the entire period of construction. Some start-up complexes were also not provided with capital investments.

Suggestions on the increase of the effectiveness of the capital investments in the food industry, nuclear electric power engineering, light industry, ferrous metallurgy, the coal industry and a number of other sectors were drawn up on the basis of the generalization of the materials of the checks of the passports of construction projects, the analysis of the reporting, the plans and the title lists. The administrations and republic offices are devoting much attention to questions of the improvement of the monitoring of the use of equipment in construction. The study of the corresponding materials enabled the bank to prepare a number of suggestions on the improvement of the monitoring of the placement of imported equipment into operation.

By Decree No 528 of 5 June 1981, "On the Regulation of the Placement of Orders for the Production of Technological Equipment in Conjunction with the Dates of Its Delivery for Installation," the USSR Council of Ministers prohibited the managers of associations, enterprises and organizations, which are the buyers of the equipment, to conclude contracts for its delivery in amounts which exceed the planned amounts of delivery for installation, as well as the standards of the carryover stocks of equipment, which are backed by bank credits.

At the same time checks showed that the managers of enterprises and construction projects are still frequently violating state planning discipline. At 417 construction projects the amount of the concluded contracts for the delivery of equipment exceeded the earmarked allocations and bank credit for the payment for it by 796 million rubles. Such cases were established at construction projects of the USSR Ministry of Power and Electrification, the USSR Ministry of Ferrous Metallurgy, the Ministry of the Automotive Industry, the USSR Ministry of Nonferrous Metallurgy, the Ministry of the Chemical Industry and others. At present the All-Union Bank for Financing Capital Investments jointly with USSR Gosbank has taken additional steps on the tightening up of the monitoring of the use of domestic equipment at construction projects and enterprises.

The All-Union Bank for Financing Capital Investments jointly with the USSR Academy of Sciences has analyzed the use of amortization deductions, which are intended for the capital repair of the fixed capital of industry. Considerable assets in the form of amortization deductions are being allocated annually for the assurance of the reproduction of fixed capital. In 1979 in the national economy 67.9 billion rubles of amortization were credited, including 36.9 billion rubles in industry.

The results of the analysis of the use of the amortization deductions, which are intended for the capital repair of the fixed capital of industry, were discussed in the Scientific Council of the USSR Academy of Sciences. Apparently, in the drafts of the long-range and current plans of the development of the sectors of the national economy the industrial ministries should stipulate the amounts of the retirement of fixed production capital in conformity with the amounts of the amortization deductions for renovation, with the intent to decrease the degree of wear of operating equipment, as well as the expansion of the operating production capacities of machine building with the expectation of the increase of the production of equipment up to the complete replacement of obsolete equipment in the necessary amounts. A procedure must be introduced, in accordance with which the equipment being produced by the sectors of machine building should be delivered first of all for the replacement of worn out means of labor. It is necessary to increase considerably the capacities for the centralized repair of machines, having created special repair firms, and to perform capital repair, as a rule, at the same time as the modernization and renovation of machines and units. As for equipment which has served its life or is obsolete, it is inadvisable to carry out its capital repair.

The large amount of worn out and obsolete equipment is due primarily to the fact that the bulk of the new equipment (up to 60 percent) is being allocated for the construction of new enterprises and the expansion of operating one, and not for the replacement of worn out equipment. In this connection the orders of operating industrial enterprises for new equipment for retooling are being far from completely met.

On the basis of the prevailing norms of amortization deductions for renovation, in industry in connection with wear 4.8 percent of the fixed production capital with respect to its value should be retired annually, but in fact in 1979 only 1.4 percent was retired.

The slowing of the rate of retirement of fixed capital is leading to the increase of the degree of its wear, which on 1 January 1980 came to 35 percent as against 30 percent on 1 January 1976. In industry more than one-third of the machines have been in operation for more than 10 years, while for a number of ministries--the Ministry of Heavy and Transport Machine Building, the USSR Ministry of Ferrous Metallurgy, the Ministry of the Electrical Equipment Industry--about one-half of the equipment has. In the pool of metal-cutting equipment 1.5 million machine tools have been in operation with the exceeding of the standard service life.

In spite of the steps being taken, the situation with settlements in construction is still bad. The nonpayments of clients have increased by nearly 71 percent, while those of contractors have decreased by a little more than 12 percent. At the same time a large amount of the bills of contracting organizations have not been submitted for payment due to flaws with respect to completed projects, start-up complexes, sections of construction and enterprises as a whole. This especially pertains to general construction ministries--the Ministry of Construction of Heavy Industry Enterprises, the Ministry of Industrial Construction and the Ministry of Construction. As a result the overdue indebtedness on bank loans is decreasing negligibly. Consequently, the institutions of the bank, which engage in the financing of clients or extend credit to contracting departments, should achieve in the shortest possible time a decrease of the nonpayments and should review the state of affairs with respect to the main contracting organizations with the interested ministries.

Too little attention is still being devoted to the use of settlements for equipment which has been delivered in complete sets and has been installed. In machine building and the chemical industry the proportion of long-term bank credit in the structure of the sources of the financing of capital investments is decreasing.

The questions of the monitoring of the purchase of equipment merit special attention. Subdivisions for the checking of the prices for equipment have been organized in more than 200 offices and departments of the bank. Unfortunately, they are engaged only in the checking of prices, but are not studying pricing. The availability of estimates of the temporary prices for custom-made equipment and the availability of obsolete equipment at construction projects are not being checked. Apparently, the work in this section must be intensified and the functions of the subdivisions for the checking of the prices for equipment must be broadened.

For the accomplishment of the tasks ensuing from the decree of the CPSU Central Committee and the USSR Council of Ministers on the improvement of planning and estimating, thought should be given to the improvement of the organization of the study by the bank of the plans and estimates.

The collective of the bank and its institutions will do everything necessary to implement the decisions of the 26th CPSU Congress.

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## CONSTRUCTION PLANNING AND ECONOMICS

### TIME FACTOR AWARENESS--KEY TO GOOD CONSTRUCTION MANAGEMENT

Moscow EKONOMIKA STROITEL'STVA in Russian No 10, Oct 82 pp 27-28

[Article by A. A. Klimov, candidate in economic sciences: "Consideration of the Time Factor in the Economic Validation of the Organizational Structure of Construction Management"]

[Text] The 26th CPSU Congress has set the task of improving the organizational structure of management. Its accomplishment depends to a large extent upon the degree to which the methods of the economic validation of organizational structure variants are perfected.

Numerous studies which have been conducted both in our country and abroad have shown that changes in the organizational structure of management exercise a material influence on the final work results of organizations and enterprises. At the same time, this influence frequently does not occur directly, but is mediated by other factors.

This situation makes it difficult to analyze the effectiveness of variants for improving the organizational structures of construction management. For example, a failure to fulfill a production program is frequently explained by a shortage of metal, cement, ferroconcrete products, and so forth. At the same time, in a large number of cases one observes an overfulfillment of production plans by plants of the production base, but with the plan fulfilled here sometimes on the basis of "profitable" products and in violation of the overall nature of deliveries to construction organizations. As a result, scarce cement, metal, and live labor is frozen in so-called prefabricated ferroconcrete "non-disposables." The reason here, as can be seen, is not so much the scarcity of resources as their unwise use on account of a lack of organizational economic unity on the part of the chief participants in construction. Similar examples could be cited for transportation enterprises and subcontracting organizations whose number at certain construction projects reaches 10 and more. Moreover, they are frequently subordinated to different ministries and departments.

As a way out of the situation most investigators and many practical workers propose uniting all of the basic participants in construction into powerful construction and installation organizations (associations) which would perform the construction and commissioning of capacities and objects in an overall

manner. There are also proposals to integrate the production infrastructure in accordance with the territorial principle in order, by eliminating departmental barriers, to increase the work efficiency of the enterprises of the production base and to decrease the dispersion of capital and resources over many small low-profit organizations. These and certain other proposals underwent practical verifications and were recommended for introduction by well-known directives.

At the same time, although there were unquestionable successes, the organizational changes sometimes did not produce the expected effect. This situation gave rise to an understandable caution on the part of practical workers with regard to all kinds of improvement plans for managerial systems and considerably complicated the realization of planned measures which from the theoretical point of view were irreproachable and which promised a substantial economic effect.

Thus, calculations showed that the creation of a large production construction and installation association (PSMO) would make it possible to obtain an economic effect equal to 0.8-1.2 percent of the work volume performed by the association and would promote an increase in labor productivity, a decrease in the cost of construction and installation work, and so forth. However, in practice the unification of several independent trusts into a single whole frequently leads to a worsening of work indicators. For example, after a number of independent subdivisions of the Glavzapaduralstroy were combined under the management of the Berezhnikikhimstroy which had the characteristics of a PSMO, the fulfillment level of the production program came to 75.2 percent in the first year, and 64.1 percent in the second. In addition, the labor productivity plan was fulfilled at the level of 91.8 and 83.4 percent, respectively, while the level of costs (in percent of the estimated cost) increased from 89.4 to 103.9 percent. An analysis showed that this situation was the consequence not only of managerial organizational factors. At the same time, the restructuring of management was undoubtedly reflected in the work results of this management. What is the problem?

In our view, it is that here, and in a large number of similar cases, we have the effect of two causes. The first is the insufficiently full and scientifically substantiated character of the transformations (the Berezhnikikhimstroy management, in particular, had an overly complex organizational structure, the number of subdivisions exceeded the manageability norm, the level of specialization within the organization was insufficient, the workload on the primary production units was too small, and so forth). The second cause is that the time factor was not taken into account in planning and realizing the improvement measures for the organizational structure of management.

While the first cause can be eliminated by more detailed work on the management organizational structure improvement variants, the second has an objective character. The fact is that the results of various organizational transformations do not show up instantly. Research shows that at the first stage, when the reorganization of a developed structure takes place, there ensues a moment

during which the old organizational form is no longer able to provide even for the previously attained capacity, while the new one has not yet stabilized and, consequently, cannot yet produce the expected effect. The length of this period depends upon the dimensions and depth of the transformations, and upon the character and consistency of their performance. Actually, the unification of previously independent subdivisions into a single whole is connected with a certain restructuring of these subdivisions (the reconstruction of the enterprises of the production base, a deepening of the specialization of the construction and installation administration, the construction administration, the mobile mechanized column, and so forth), which in itself hinders the growth, precisely during this period, of their capacities and in a large number of cases leads to a deterioration of the basic production work indicators.

If the measures being carried out have been based on a strict scientific computation, this will be followed by a second stage when the expected economic effect gradually begins to show and the transformations have their effect. During this period the economic indicators of an organization's work reach their base level or even exceed it. And, finally, at the third stage the new structure is finally stabilized and the production system as a whole comes out onto its assigned operations mode.

If what has been described was to be presented graphically, the situation of an organization in which a restructuring of the organizational structure is being carried out would be characterized by an undulating curve whose lower point coincides with the first period, and whose maximum point coincides with the third. This proposition provides a good illustration of the experience connected with the creation of the Minsk Industrial House Construction Production Association of the BSSR Ministry of Industrial Construction. During the first year after its formation on the basis of three trusts all of the basic production work indicators decreased by 5-10 percent compared to the base year. The indicators became stabilized after three years. From that time on the effect from the creation of the Association began to fully manifest itself. The plan for commodity construction output was fulfilled by 112.1 percent, for profits by 115.1 percent, and the work volume performed with its own resources increased from 65 million rubles to 70 million rubles, while output rose from 15,883 to 16,825 rubles per worker, or by 6 percent.

The above-cited propositions and facts show that the influence of the time factor has to be considered in an economic substantiation of measures to improve the organizational structure of the management of construction at the stage when they are planned.

The determination of the magnitude of the time lag between the beginning of the reorganization of a structure and the receipt of the expected effect requires an individual approach and, at least at the present time, cannot be rigidly regulated by normatives, although there is no doubt that the length of each of the above periods and their sum total are influenced by a rather constant group of causes. The magnitude of the time lag will be minimal if the restructuring of the organizational structure of management is, first, an overall

one (when changes in the individual elements of the system are provided for by the plan with regard to their interconnection with other elements), secondly, gradual (stage-by-stage), and, thirdly, planned (coordinated with the planning indicators for the work of the entire organization--especially at the first stage of the reorganization it is appropriate to plan a substantial increase in work volumes, a decrease in their cost, and so forth).

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## CONSTRUCTION MACHINERY AND EQUIPMENT

UDC 69.002.5"71"69(211)

### KRASNOYARSK CONFERENCE ON NORTHERN-MODIFICATION CONSTRUCTION MACHINERY

Moscow MEKHANIZATSIYA STROITEL'STVA in Russian No 1, Jan 82 (signed to press 7 Dec 81) pp 3-4

[Article by Candidate of Technical Sciences V. I. Polyakov and Engineer V. V. Kolesnichenko, magazine public correspondents, under the heading "Under Comprehensive Target Programs": "Machinery Under Harsh Conditions (From the All-Union Scientific-Technical Conference on Problems of Developing Construction Equipment for Siberia, the Far East and the Far North)"]

[Text] An all-Union scientific-technical conference devoted to questions of creating and mastering construction equipment for operation in Siberia, the Far East and the Far North was held in Krasnoyarsk on 23-25 September of last year. Participating in the conference were representatives of the Ministry of Construction, Road and Municipal Machinebuilding, the USSR State Committee for Science and Technology, Ministry of Nonferrous Metallurgy, USSR Gosstroy, USSR Ministry of Installation and Special Construction Work, Ministry of Transport Construction, USSR Ministry of Construction of Heavy Industry Enterprises, Ministry of Construction of Petroleum and Gas Industry Enterprises, the Siberian Division and Ural'sk Scientific Center (USC) of the USSR Academy of Sciences, branch scientific research and planning-design institutions, party and public organizations.

The conference organizing committee was led by USSR Academy of Sciences USC presidium chairman and Academy member S. V. Vonsovskiy.

The first all-union conference on such questions was held in Krasnoyarsk in 1966. In the intervening period, excavators, 5-ton tower cranes, bulldozer rippers, 25-ton cranes on wheels and other machinery for operation at temperatures below  $-40^{\circ}\text{C}$  have been created through the efforts of many organizations, foremost the Ministry of Construction, Road and Municipal Machinebuilding. But the machinery developed does not correspond either in products list or in numbers produced to the amounts of construction-installation work or the soil and climatic conditions of this region. The continued, accelerated development of productive forces in Siberia anticipated by the 26th CPSU Congress necessitates the development of more-reliable, highly productive equipment.

As L. G. Sizov, secretary of the Krasnoyarskiy Kray party committee, reported in his brief introductory remarks, the amounts of earthmoving work in frozen

and permafrost ground already exceeds a billion cubic meters and the amount of loading and unloading work exceeds 250-280 million tons. When erecting industrial facilities, extensive use is made of the effective conveyor method of assembling units weighing up to 120 tons.

L. G. Sizov noted that construction workers and machinery operators are not satisfied with a situation in which cranes basically operate only at temperatures above  $-20^{\circ}\text{C}$ , only two 5-ton models of KhL [not further identified] tower cranes are being received, and internal combustion engines are hard to start at low temperatures. We need the coordinated efforts of the State Committee for Science and Technology, its scientific council for the North, and planning agencies to resolve as fast as possible questions of creating equipment necessary for Siberia and the North.

VNIISTROYDORMASH [All-Union Scientific Research of Construction and Road Machinery] director and professor V. A. Bauman reported that the Ministry of Construction, Road and Municipal Machinebuilding plans to release more than 45,000 pieces of construction machinery of 30 types in a KhL modification in the 11th Five-Year Plan. In this regard, it was noted that not all related ministries are supplying the necessary amounts and quality of assembly components and materials. This is particularly true of deliveries of base tractor chassis, automobiles and pneumatic prime movers in northern modifications.

Deliveries of series T-130.1G., T-180G and DET-250M tractors for operation at temperatures down to  $-45$ - $-50^{\circ}\text{C}$  are clearly inadequate.

Powerful bulldozers and rippers cannot be utilized due to omissions and delays in the series production of the T-330 tractor. A similar situation has developed in the production of mobile machinery based on the KrAZ-257K, ZIL-131, Ural-375Ye, MAZ-504V and ZIL-130V-1-66 trucks.

The lack of northern-modification chassis prevents us from beginning series production of a number of types of machinery, including 8- and 13.5-ton cement haulers, 16-ton truck cranes and others.

Shortfalls in deliveries of KhL-modification engines and storage batteries and the inadequate reliability of engine warmers and cab heaters have a substantial influence on further expanding the release of E-652B and EO-4121A excavators, DZ-31-1 and DZ-98 graders and other machinery.

The report noted the poor quality and inadequate release of rubber items.

Under GOST [All-Union State Standard] 14992-69, the metal components used in manufacturing KhL-modification machinery must be made from category 14-15 impact-strength steel (at  $-70^{\circ}\text{C}$ ). In fact, branch plants often receive steel in categories 1-4, which are unsuitable for machinery being supplied to the northern region. The efficiency of construction materials and pressure fluids depends largely on the quality of the lubricants and pressure fluids, but not enough of the nonfreezing "Torsiol-55" cable lubricant is being produced.

The reports by TsNIIOMTP [Central Scientific Research Institute for the Organization and Mechanization of and for Technical Aid to Construction] associates

representing the USSR Gosstroy analyzed the status of the availability of machinery to construction organizations of the region and the servicing and repair of construction equipment. They reveal inadequacies in the power structure of the fleet and the products list of machinery and special means of transport intended for use under the specific operating conditions of Siberia, the Far East and Far North. The unified machinery operability temperature limit adopted in 1964 must be adjusted to  $-60^{\circ}\text{C}$ .

The speakers' opinion was that the development of an interbranch comprehensive target program was necessary to continue improving the status of the production of northern-modification machinery.

V. A. Yazovskikh (USSR Academy of Sciences USC) presented research results on machinery and means of transport in organizations of the Ministry of Nonferrous Metallurgy and Ministry of Coal Industry in the Far East and North. It was established that the average power of machinery in ore-mining and coal industry in the indicated regions is significantly lower than in foreign practice. Some 87 percent of the bulldozers in use are based on the low-power T-100M, T-130 and T-180 tractors. Bulldozers are used basically without rippers. Single-scoop loaders with scoop capacities of 2.7 cubic meters are used, when loaders with 10-cubic meter scoops or larger are appropriate.

Tractors have a short service life; KhL-modification automobiles do not have substantial advantages over ordinary vehicles, since they are manufactured in the absence of GOST's. The optimum tractor for these conditions is one in the 35-ton class, but 49 percent of the tractors in the fleet in use are smaller. Calculations have established that the proportion of bulldozers in the 25-ton or larger class must be at least 80 percent of the fleet.

O. Ye. Stepanov spoke of steps to improve the machinery servicing and repair system. They include centralized servicing on the basis of flow charts developed for all vehicles.

VNIISTROYDORMASH Krasnoyarsk Branch Director A. B. Sukhovskiy reported that the branch did considerable work in the 10th Five-Year Plan on refining specifications for KhL-modification machinery and on improving their reliability. Extensive equipment testing under operating conditions enabled us to prepare proposals on improving the machinery for manufacturing plants. The branch worked out and participated in mastering the production of 15 northern-modification machines. Primary attention was focused on the development of machinery for working frozen ground. The BM-2000 drill for drilling 1.2 meters across and 20 meters deep ensured that work could be done when installing foundations under ram-drilled piles.

The BM-1500 based on the EO-4121 excavator (drilling depth -- 15 meters, diameter -- 0.35 and 0.65 meter) yielded positive results under permafrost conditions.

Series production of hydraulic hammers for use as replaceable working tools for excavators in size groups II and III has been mastered using branch developments.

High-strength cutting tools for machinery, the ETTs-165 excavator in particular, have been developed to increase the operating efficiency of trenching excavators

in frozen ground. The speaker noted the necessity of precisely delimiting the cold climate zone and of corresponding adjustment of GOST 15150-69.

A. V. Abramov, deputy director of the Cheboksary Industrial Tractors Plant devoted his report to steps to improve the reliability of the T-330 tractor. When operated under various conditions, including extreme ones, individual models in an experimental lot of the tractors demonstrated an accrued operating time of up to 1,500 motor-hours per year. To improve the reliability of the tractor as a whole, we need to improve the reliability of the electrical equipment, transmission and pumps. We plan a significant increase in the release of spare parts for each tractor and increasing that share, in cost terms, to 40 percent of the cost of the tractor.

The Ministry of Tractor and Agricultural Machinebuilding and the plant organized a network of specialized centers (in L'vov, Moscow, Cheboksary, Novokuznetsk, Svobodnyy, Ekibastuz, Nadym and elsewhere) to service and repair the T-330. These centers can handle 100, 300 or 500 tractors. At the same time, the considerable scattering of the available fleet among construction organizations makes planned service difficult and prevents loading these centers normally. Thus, only 10 of 90 tractor customers have five tractors or more.

In the design stage is a new tractor model with a traditional arrangement anticipating the possibility of a hydraulic unit and an air-cooled diesel. A KhL-modification T-330 tractor is being developed in which 52 assembly components provided by the automotive and tractor industry must be in a KhL modification. If this is done, the motor life will be 6,000 machine-hours, with a proposed subsequent increase to 8,000 machine-hours.

The NAMI [Central Scientific Research Institute of Automobiles and Automobile Engines] representative dealt with the use of means of motor transport in the North and Siberia. One feature of these vehicles is a low specific pressure, enabling them to move through saturated and marshy sectors ( $0.2 - 0.4 \text{ kgf/cm}^2$ ). This pressure can be ensured first of all in special vehicles with caterpillar and wheel propulsion.

An experimental lot of the URAL-59-20 snow-swamp vehicle has been released, and we plan to increase its production. We intend to manufacture BelAZ vehicles and pipe- and lumber-haulers in a KhL modification. All these vehicles will require a broad products list of assembly components and pressure fluids in a KhL modification.

The representative of the Ministry of Nonferrous Metallurgy's transport administration detailed the operation of motor transport in ore-mining industry in the northern region, where only four percent of the vehicles and about 10 percent of the special machinery being operated under extreme conditions and at temperatures of down to  $-62$ - $-65^\circ\text{C}$  are in a KhL modification, the remainder being general-purpose trucks. At the same time, shipments of these vehicles will increase 1.6- to 1.8-fold in the 11th Five-Year Plan.

Under these conditions, the progressive form of operating and servicing known as the brigade-flow-line method of shipment, in which the driver is replaced so he can rest, but the vehicle operates continuously, is very important. This permits increasing daily accrued operating time from 11 to 22 hours.

Along with mastering the production of northern modifications of reliable vehicles, we need to plan the production and distribution of sufficient amounts of arctic diesel fuel and lubricants, AMK-10 and others in particular, to the North. The Gosnab should anticipate shipping out vehicles to customers in the Far East and North prior to 1 August of each year, so as to use the waterways in the summer. In conclusion, the speaker expressed a desire that the State Committee for Science and Technology would assume supervision of the manufacture of vehicles in a KhL modification.

A. G. Nasibov (TsNIIchermet [Central Scientific Research Institute of Ferrous Metallurgy imeni I. P. Bardin]) spoke of the status of work on developing effective high-strength (550-600 MPa) steels with guaranteed ductility properties down to  $-70^{\circ}\text{C}$ .

The provision of construction in northern regions with nonfreezing low-alloy steels cannot be called satisfactory. Only thick-sheet steel, some of which has been heat-treated, is supplied in an adequate assortment. Low-alloy shaped steel is supplied only in thicknesses up to 11 mm.

Given the increasing demand for nonfreezing steel for use in temperatures down to  $-70^{\circ}\text{C}$ , actual deliveries of steel up to 150 mm thick are only in hot-rolled form (no heat-treatment), with guaranteed properties at temperatures down to  $-40^{\circ}\text{C}$ .

The limited opportunities for heat-treatment complicate the delivery of low-alloy nonfreezing rolled steel, especially in categories 9-15, which are needed for construction equipment, so we therefore need to increase capacities for heat-treating low-alloy sheet steel and to develop thermal equipment for treating shaped and graded rolled steel.

A number of reports examined questions of developing and improving the quality of construction of general- and special-purpose construction and transport machinery, as well as their operating units and cutting tools; they dealt with questions of servicing and repairing equipment on location and in fixed shops, with the necessity of creating mobile facilities for servicing machinery and eliminating malfunctions.

Many of the speeches stressed the necessity of increasing the roles of the Ministry of Automotive Industry, Ministry of Tractor and Agricultural Machinebuilding, Ministry of Petroleum Refining and Petrochemical Industry, Ministry of Power Machinebuilding and Ministry of Electrical Equipment Industry in mastering the production of northern equipment by broadening the products list and quantity and improving the quality of assembly components in a KhL modification.

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MORE EFFICIENT DESIGN OF DZ-129KHL BULLDOZER-RIPPER

Moscow STROITEL'NYYE I DOROZHNYYE MASHINY in Russian No 6, Jun 82 (signed to press 25 May 82) pp 3-4

[Article by Candidate of Technical Sciences G. A. Shloydo and engineers B. Z. Zakharchuk and O. V. Vereynov (VNIISTROYDORMASH [All-Union Scientific Research Institute of Construction and Road Machinery]) under the heading "Construction and Road Machinery": "New Ripper for T-330 Tractors"]

[Text] The DZ-129KhL, a T-330 tractor onto which a DP-29KhL ripper and a front DZ-124KhL bulldozer have been mounted, was one of the exhibits at the international "Stroydormash-81" exposition.

The DZ-129KhL bulldozer-ripper (see picture [not reproduced for this report]) is designed for difficult earthmoving work, including working frozen ground with many rocks (the unit's equipment ensures effective ripping down to  $-15^{\circ}\text{C}$ ) and broken-rock ground in industrial and hydraulic-engineering construction, in ore-mining industry, in reclamation and irrigation projects, as well as in erecting embankments, piling coal and gravel, and so on.

The ladder-type ripping equipment consists of a support frame, lower rod, operating arm, articulated upper rod and three hydraulic cylinders, two for raising and lowering the tooth and one for changing the ripping angle. The hydraulic cylinders for raising and lowering the tooth are unitized with the hydraulic cylinder for changing the ripping angle, differing only in that built into their pistons are overflow valves to protect the hydraulic system from overloading at the extreme piston positions.

The support frame is welded from rolled sheet rigidly secured to the tractor rear axle housing. The articulated upper rod consists of front and rear elements connected, correspondingly, to the support frame and working arm. The hydraulic cylinder for changing the ripping angle connects the rod articulation with the operating arm articulation. The tooth raising-lowering hydraulic cylinder piston rods are connected to the operating arm slightly above the lower rod articulation. This design resolution enables us, depending on the properties of the ground, to regulate the ripping angle over a  $25-50^{\circ}$  range. Increasing the ripping angle significantly accelerates tooth penetration into the ground and reducing the ripping angle helps increase the productivity of the machinery and reduce energy consumption given sustained ripping; the minimum ripping angle is used when working frozen ground and breaking open rocky ground. A ripper

with a regulated ripping angle therefore ensures that optimum parameters will be obtained both when deepening and when a sustained ripping routine is used.

In connection with the fact that the operating unit is quite heavy, remote-control transposition of the tooth in the operating arm done from the tractor cab by switching on the auxiliary hydraulic system distributor is anticipated on the ripper.

The ripper tooth is equipped with a wear-resistant cover plate.

The bulldozer equipment consists of a blade with cutters, pushing skids, a blade skew hydraulic cylinder, helical strut, two diagonal braces and a skew compensation mechanism. The blade is replaceable with a straight BGN-25 or a spherical one.

#### DZ-129KhL Specifications:

##### Base T-330 Tractor

engine power, in kW	242
transmission	hydromechanical
speed, in km/hr	
forward	0-15.1
reverse	0-12.5
hydraulic system operating pressure, in MPa	14.5
weight, in tons	38

##### DP-29KhL Ripper

type	single-tooth
appearance	four-link, with regulated ripping angle
maximum depth, in mm	1,400
tooth attachment	rigid
range of ripping angle regulation, in degrees	25
control (raise and lower, change ripping angle)	hydraulic
weight, in tons	6.6

##### DZ-124KhL Bulldozer

blade height, in mm	1,550
blade length (spherical), in mm	4,730 (4,900)
blade drop below track support surface (excluding lugs), in mm	700
blade transverse skew angle, in degrees	±12
basic cutting angle, in degrees	55
range of cutting angle regulation, in degrees	±10
blade skew control	hydraulic
cutting angle change	hydraulic, with helical strut
weight, in tons	7.7 (8)
total weight of unit, in tons	52.3 (52.6)

In laboratory tests on a proving ground, we evaluated the traction-coupling properties of the tractor with mounted bulldozer-ripper equipment (bulldozer with a spherical blade) on specially prepared ground without stubble. Category III loam, 19-20 percent moisture (number of blows with DorNII densimeter C = 9:13). The tractor's maximum tractive force was 548.5 kH.

Operating tests were conducted in the winter for mechanical ripping and bulldozing (spherical blade) in frozen ground for stripping in Magadanskaya Oblast in air temperatures of -23°C to -43°C. The sectors worked were frozen coarse-

gravel - sand-clay and peat-type ground at 10 percent moisture content and minus 23-24°C with admixtures of sandy-loam and sandy-argillaceous material.

Blocks of frozen ground 60 meters long and 20 meters wide were worked to determine the technical productivity of the unit. Layer ripping was done longitudinally and laterally (the longitudinal-intersect method) in two layers, each layer of ripped ground being removed by the bulldozer and deposited on the bank of a trapezoidal form. The lengthwise ripping was done in contiguous ring-shaped passes, turning the tractor at the end of the cut, and the transverse ripping was done in consecutive passes, the tractor idle-running in reverse. The ripped material was bulldozed in a parallel pattern. The average length of the lengthwise ripping step was 0.83 - 1 meter and of the transverse step -- 0.9 - 1.3 meters; the larger step was for the upper layer and the smaller step was for the lower layer.

A ripper bulldozer on a D9H Caterpillar (USA) tractor with a 300 kW engine was tested simultaneously under analogous conditions.

The ripping time was about 55 percent of the total time spent working each sector. The units achieved an overall stripping depth of 0.83 meters (for the DZ-129KhL) and 0.73 meters (for the D9H); average depth of material worked was 0.45 and 0.39 meters, respectively.

	D9H	DZ-129KhL
engine power, kW	300	242
ripping depth, meters		
overall	0.39	0.45
upper layer	0.21	0.27
lower layer	0.18	0.18
ripping speed, km/hr		
longitudinal	2.6	2.2
transverse	2.75	2.27
productivity, m <sup>3</sup> /hr		
ripping	177.4	152.3
ripping and bulldozing	102.4	90.2
specific productivity, m <sup>3</sup> /hr·kW		
ripping	0.59	0.69
ripping and bulldozing	0.34	0.41

Comparative data on the technical productivity of the units are given in the table. In this regard, inasmuch as the units tested had engines of different power, we also used in analyzing their effectiveness the concept of specific hourly technical productivity related to a unit of power of the base tractor. As is evident, the DZ-129KhL unit has higher specific indicators both for ripping and for bulldozing, testifying to the more efficient design of this piece of machinery.

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## CONSTRUCTION MACHINERY AND EQUIPMENT

DZ-121 PUSHER-BULLDOZER FROM CHELYABINSK

Moscow STROITEL'NAYA GAZETA in Russian 12 Mar 82 p 3

[Article: "Pusher-Bulldozer"]

[Text] The DZ-121 pusher-bulldozer is designed to push scrapers with scoop capacities of up to 15 m<sup>3</sup> for heavy earthmoving jobs in the construction of road, hydraulic engineering and reclamation projects. Moreover, the pusher-bulldozer can do bulldozing, and the availability of ripper equipment permits its use to work frozen ground and crumbling rock.

Using the DZ-121 bulldozer to push scrapers enables us to increase their productivity and efficiency.

Manufacturer -- Chelyabinsk Road Machinery Plant imeni Kolyushchenko (454000, Chelyabinsk, Ul. Stepana Razina, 1).

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SB-132 CONCRETE HAULER TESTING COMPLETED

Moscow STROITEL'NYYE I DOROZHNYYE MASHINY in Russian No 6, Jun 82 (signed to press 25 May 82) p 3

[Article by Engineer L. M. Portugal'skiy (Slavyanskiy Construction Machinery Plant imeni XXV s"yezda KPSS) under the heading "Construction and Road Machinery": "SB-132 Concrete Hauler"]

[Text] A new concrete hauler, the SB-132, designed to deliver ready concrete mix from concrete-mixing centers to where it will be laid, agitating it en route and pouring it for the customer, has been manufactured at the Slavyanskiy Construction Machinery Plant imeni XXV s"yezda KPSS using a design by the VNII-Stroydormash [All-Union Scientific Research Institute of Construction and Road Machinery] and the "Stroy mash" special design bureau.

The concrete hauler can be used as a cement mixer, in which case the mixing water is fed to the mixing drum simultaneously with the the cement hauler's charge of dry concrete mix components. The mixing is done while traveling to the site. It is intended for operation at ambient air temperatures of  $-40^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$ . For operation at below-zero temperatures, the mixing drum, water tank and cement hauler pipes are kept warm by a polyurethane foam layer of insulation.

The SB-132 cement hauler is unitized with the SB-130 cement mixer, distinguished from it only in its smaller water tank. It belongs to the type of wheeled concrete transporting vehicles of large capacity whose working unit is a cigar-shaped drum resting on a hinge and two roller bearings.

The technological equipment for the SB-132 concrete hauler (see picture [not reproduced for this report]) is mounted on a special pad semitrailer for the KamAZ 54112 prime mover. The concrete hauler can be loaded from special installations and fixed or mobile concrete plants adapted to feed ready-mix and dry concrete mixes to concrete mixers.

SB-132 Cement Hauler Specifications:

concrete mix hauling capacity (given $v=2.2 \text{ t/m}^3$ ), in $\text{m}^3$	8
drum geometric capacity, in $\text{m}^3$	14
water tank capacity, in $\text{m}^3$	0.65
drum angle of inclination to the horizon, in degrees	10

drum rotation speed, in rpm  
type of diesel engine  
diesel engine power, in kW

4-14  
D-145T  
55

The drum drive consists of a self-contained diesel regulating the pump, hydraulic transmission and planetary gear.

The concrete is mixed by clockwise rotation of the drum while the vehicle is moving; counter-clockwise rotation discharges the concrete. The water in the tank is used basically to wash the mixer drum. It is fed from the tank to the drum by compressed air taken from spare receivers filled from the semitrailer braking system through a safety valve.

Acceptance testing completely confirmed the conformity of the concrete hauler's parameters to normative specifications.

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## CONSTRUCTION MACHINERY AND EQUIPMENT

### INCOMPLETE DELIVERIES SCORED

Moscow IZVESTIYA in Russian 2 Apr 82 p 2

[Article by Ye. Spiridonov under the heading "Notes of An Economic Reviewer": "How to 'Divide' an Excavator, Or Why the Consumer Sometimes Receives Machinery Without Complete Sets of Subassemblies and Parts"]

[Text] A letter from engineering-technical and other workers at the "Uralmash" association was published in the No 42 issue of our newspaper. They reported that allied enterprises in electrical equipment industry were not meeting contract obligations on electric motor deliveries. As a result, the authors wrote, we are shipping coal miners and oilfield workers incomplete excavators, drillings rigs, earthmoving and other large machinery. Equipment created by the labor of many collectives was out of circulation. Letters and telegrams similar in content have been received by the editors from other leading plants as well.

On receiving such news, one involuntarily wonders why workers at the largest machinebuilding enterprises are forced to ask equally prestigious related enterprises to meet delivery obligations which, as is known, are ratified by contract and have the force of law. Are the leaders of the ministries of heavy and transport machinebuilding and electrical equipment industry really unable to regulate the interaction of enterprises of their own branches?

Everyone understands that the whole does not always equal the sum of the parts. If, for instance, you were to pay for a washing machine in a store and then receive separately from various plants and at various times the drum, housing and control unit, it would be hard to presuppose when and how all these parts would acquire the form and content of the actual unit. Production-technical output cannot always be shipped out to a customer assembled. But even when the reference is to bulky equipment, the regulations on deliveries demands that the manufacturer do control subassembly fitting and test and ship out the major units. In all instances, complete-set delivery obligations are considered met if the customer has received all the equipment in the set within the schedules established by the contract.

Just how does this ill-starred "incomplete" occur? It is the offspring of the phenomenon of "divided delivery." Seeing that the disproportion between the

production of basic technological equipment at the "Uralsmash" and the release of motors by enterprises of electrical equipment industry cannot be eliminated. USSR Gosplan and Gossnab workers make a "Solomon-like" decision that an excavator, say, must be divided so as to combine the opportunities of the branches. And they issue a deferment on the delivery of assembly-component electrical equipment for equipment already manufactured, that is, they permit the "Uralsmash" to ship out the mechanical portion of the equipment to customers with no expectations as to when the motors will be shipped. For now, they say, the equipment is en route, and the motors will appear when its assembly gets underway.

But they unfortunately do not go after the electric motors. They are not received on time not because the "Dinamo" electrical equipment association in Moscow is late in shipping them out, but because they have not been manufactured yet. And although super-extraordinary production schedules are drawn up for assembly components in light of the delivery shortfall, the indebtedness is not made up, since the material resources and technological production cycle remain as before at the electrical equipment plant. In fact, the reverse: there is an artificially diminished sense of responsibility for completing sets of equipment already shipped out to customers.

Thus, the year before last, "Uralsmash" workers shipped customers 32 crushers without electric motors, and with a clear conscience, inasmuch as USSR Gosplan deputy chairman N. Slyun'kov and USSR Gossnab deputy chairman B. Yakovlev postponed electrical equipment delivery by a quarter. But hopes that related enterprises could count on the "Uralsmash" the following year turned out not to have been justified. Electrical equipment enterprises not only failed to meet their debt, but did not even provide what was stipulated in the plan for the next year. And the customer then had 85 incomplete crushers. The story is the same with regard to drilling machinery.

What, then, is the sense, you ask, of divided deliveries if they still do not ensure the receipt of operable equipment? True, "incompletes" only harm the customer. In fact, putting equipment into operation can be "prolonged" for him only by lowering the fuel or ore extraction plan and that, of course, suits no one. Let's examine what this means to the supplier of the equipment.

Normative net and marketed output plan fulfillment with consideration of contract deliveries, as is anticipated by steps to perfect the economic mechanism, must be recorded only if all equipment shipped out by the manufacturer fully meets the technological demands being made on it, that is, only when it can be put to use. The labor expended on output not pleasing to the customer is not credited to the enterprise.

Incomplete sets of "Uralsmash" equipment drilling rig and coal mine workers have already has hundreds of millions of rubles invested in it. What, then is the financial situation of the association? It would appear that it must be solidly in arrears in normative net output volume, marketed output volume and nonperformance concerning contract obligations. And so it would, were it not for the rehabilitating permission for divided delivery. Inasmuch as the enterprise is considered to have shipped out incomplete sets of equipment not through its own fault, the shipped machinery parts are counted in the delivery plan as equipment

ready for operation, that is, the cost of electrical equipment not shipped to related enterprises is not eliminated and the delivery plan is considered to have been met. As a result of this operation, the leadership of the manufacturing enterprise is not deprived of bonuses for basic economic activity results and the material incentives fund for the collective is not reduced.

Why, then are enterprise workers still dissatisfied with their situation? The fact is that counting equipment delivered in incomplete sets in deliveries gives them the right to include nearly all their labor in the plan, minus that portion connected with installing the equipment. But the wage fund and labor productivity are calculated using normative net output, and the material incentives fund normative is set for each percentage point of growth in labor productivity. Full "amnesty," it would seem. But in order to recompense all expenditures of live labor, the enterprise must have a planned profit ensured by meeting the marketing assignment. And that is absent, inasmuch as the association, by supplying machinery without motors, cannot take from the customer the full cost of the equipment. This is why "Uralsmash" workers are in favor of having conditions created for them so they can release finished products.

Nonetheless, practice has shown that if output not included in marketing volume at full cost (that is, incomplete) is counted in expenditures of own labor, a psychology of "We did our part and must be paid for it" is generated among manufacturers of basic technological equipment. In omitting marketing, they are attempting to "climb into" the indicator of normative net output. But that must not be: the enterprise has no marketing, but everything is up to date concerning the plan in terms of own labor.

As is known, a harvester mows and threshes. But workers at combine plants in Rostov, Tagan Rog and Krasnoyarsk probably assume the machinery is for but one purpose. At least they often ship out combines without harvesters to "Soyuzsel'khoztekhnika" oblast associations and send out a bill for finished equipment. We did our part, they say. But if you are still interested in the harvesters, you can get them from related enterprises, the Tula and Nazarovskiy plants. And when the customer protests the delivery of incomplete equipment, its manufacturers appeal to the State Arbitration Commission. But then they themselves become defendants. As the lead suppliers, they are responsible for the delivery of complete sets, since the customer has concluded an agreement with them to manufacture whole combines, not individual subassemblies. And the enterprises are fined. In just one year of existence the State Arbitration Commission attached to the RSFSR Council of Ministers has already had 15 cases brought by the "Rossel'mash" on deliveries of incomplete equipment.

Any expenditures of one's "own" or "other" labor must be justified by national economic end results. This is the demand of the CPSU Central Committee and USSR Council of Ministers decree on perfecting the economic mechanism. As of 1 January 1982, a new instruction has been in effect on procedures for recording fulfillment of assignments and obligations concerning deliveries when evaluating the activity of enterprises and organizations and providing them with economic incentives. If assignments and obligations for delivering individual types of output of important national economic significance are not met, no bonus is paid supervisory workers for basic economic activity results. In other instances, the maximum level of marketing plan underfulfillment with consideration

of deliveries must not exceed 1-3 percent. The further the enterprise crosses this Rubicon, the more funds it loses from the material incentives fund.

Is this measure fair? After all, an enterprise often fails to meet its obligations through no fault of its own. And how else can the interests of the customer be protected? In fact, every time one "gets in a [bad] situation" and amnesty is given insolvent suppliers, each of them finds sufficient reasons to explain its failure to meet delivery terms.

"The customer is no longer a customer, but a suppliant," writes A. Domov, deputy director of the Ural'sk Machine Shop, in a letter to the editors. "The quarter is drawing to a close, and the Chelyabinsk Tractor Plant, Gor'kiy Automotive Plant and Lozovskiy Machine-Forging Plant have not yet begun pledging goods in 1982 to procure tractor connecting rods and crankshafts. We urgently need shipments of spare parts to the kolkhozes and sovkhozes, as the sowing season is beginning, but it seems we'll get nothing out of our related enterprises. Workers at Chelyabinsk Tractor Plant, for example, explain the disruption in deliveries of blanks by delays in receiving rolled metal products and by the low productivity of the roasting furnaces.

Now let's turn to the questions we asked at the start of the article. Why are we still not always successful in following delivery rules? Why is the assumed end result washed away in the course of plan fulfillment and in the end, instead of equipment at the customer, there turn out to be unconnected parts which cannot be installed? Because machinebuilders are often given assignments to manufacture amounts of basic technological equipment which it is known will not be provided with assembly components and parts. Branch opportunities are not linked, even in draft plans. For example, the incomplete crushers shipped out by the "Uralsmash" represent nearly half the annual production program for those machines. What sense does it make to give the electrical equipment branch an assignment to manufacture motors with consideration of making up for deliveries not made last year if the enterprise does not have a realistic possibility of making even what is set down in this year's plan?

USSR Gosplan and Gosstab workers unanimously support the opinion of authors of letters to the editors apropos of supply to the effect that it is time we finally understand that extending delivery schedules creates not a carryover reserve of assembly components, but only an appearance of well-being. There is nothing reassuring about having something look good on paper. We need to see what can realistically, objectively be done.

It is actually to the point to ask just when we will in practice adhere to the demand that the plan be balanced, from the instant it is typeset, in terms of material, financial and labor resources and, in so doing, guarantee that the equipment requirements of the national economy will be met.

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## OTHER METALWORKING EQUIPMENT

### MOSCOW PLANTS COOPERATE TO ECONOMIZE

Moscow PRAVDA in Russian 13 Jul 82 p 2

[Article under the heading "Routes of Leading Experience" by V. Kubrin, party committee secretary at the Machine-Tool Manufacturing Plant imeni Sergo Ordzhonikidze (Moscow): "Science Helps Economize"]

[Text] More than a year ago, the collectives of leading enterprises in Moscow began competing in the broad introduction of scientific and technical achievements with a view towards saving labor, material and energy resources. The initiative was approved by the CPSU Central Committee and has found quite a few followers nationwide. Muscovites have developed a concrete program of action to strengthen ties with science, to retool production, improve output quality and, in the end, save all resources. What was planned is being successfully implemented, as is borne out by the experience of the "Stankostroitel'nyy zavod" association imeni Sergo Ordzhonikidze. Today, we are publishing materials discussing how valuable experience spreads in the collectives of capital enterprises.

Machine-tool builders are distinguished by a heightened sense of responsibility for the results of their labor, and understandably so, as theirs is an unusual product. Machine tools with numerical preset control, robots and completely automated lines, for example, make substantial changes in production and in the organization and very nature of labor when they replace old equipment.

The effectiveness of our equipment has increased appreciably recently. Five or six years ago, a line for machining a cylinder head yielded 19,000 rubles per year per built-in machine tool; the figure today is 1.6-fold higher. The complex of automated assembly lines created in the association for the Minsk Motor Plant freed many workers for other work and the machinery freed people from operations connected with so-called high-pressure stress, vibration, and so on. The collective has done a great deal of work to equip the Kama Motor Vehicle Plant, manufacturing upwards of 70 lines for it. During the past five years, we have helped free 30,000 people for other work, the national economic impact of this reaching 75 million rubles.

Such results are not achieved without broad cooperation with scientists. The scope of that cooperation can be judged at the least by the fact that our

association has close ties with 15 scientific research and academic institutes which help the collective develop dozens of pressing production problems. The initiative by Muscovites to accelerate the use of scientific and technical achievements for the purpose of saving resources has given new impetus to this cooperation.

We have evolved solid ties with the collective of the All-Union "Soyuzstankoliniya" production association special design bureau. Our shops are very familiar with both older special design bureau workers such as N. Voronichev, V. Astakhov, V. Kozhevnikov and A. Kozlov and younger co-workers such as V. Rozhin, N. Khrustalev and S. Borisov. They do not begrudge the time spent with enterprise workers and engineers continuing work on a unit at the assembly site, "leading" it through adjustment and testing.

Work progress is usually analyzed at joint meetings of the enterprise and special design bureau technical councils. A system of moral and material incentives to production workers and designers for the results of their common work has been set up. I should like to stress that neither group considers its mission accomplished until it is convinced that the equipment supplied the customer will bring the return specified in the plan.

The demands being made on our output are constantly increasing, and the machine-tool builders take this into account. Jointly with scientists and designers, the collective has run a series of experiments aimed at expanding the automation and mechanization of machinebuilding processes. The release of modern NPC machine tools and readjustable automatic lines is being increased and sectors are being created which will be serviced by robots.

Much of our work depends on our clients. Our contacts with them are basically good, but there are "snags." Lines shipped out to an enterprise which have had expensive electronic repairs have sometimes sat in warehouses for months, sometimes even out in the open, because there was no work front for installing them. And even worse things happen, such as supplying equipment to produce output which has not even been tested or readied for production.

One would think this confusion could be eliminated if long-term ties were set up with clients and if actions were precisely coordinated. It is appropriate to plan joint work with them not for the year, as is done now, but for, let's say, three years. But in order for this to happen, the USSR Gosplan would have to issue a list of new equipment for that period. The Gosplan is examining this proposal, but it should be moving faster on it.

It is also time to resolve the question of organizing centralized courses to train people to which complex new equipment can be entrusted at customer enterprises.

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GOR'KIY AUTOMOTIVE PLANT INTRODUCES AUTOMATIC WELDED-STAMPED NUT LINE

Moscow AVTOMOBIL'NAYA PROMYSHLENNOST' in Russian No 5, May 82 (signed to press 20 Apr 82) pp 24-25

[Article by candidates of technical sciences Ye. I. Natanzon, V. F. Lysenko and L. S. Temyanko (Gor'kiy Motor Vehicle Plant): "Comprehensive Automated Line for the High-Precision Manufacture of Welded-Stamped Parts"]

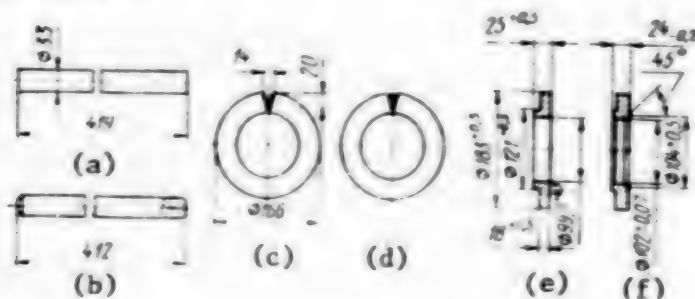
[Text] Technological processes for the high-precision manufacture of hot-stamped parts made from welded blanks have been developed and introduced at the Gor'kiy Motor Vehicle Plant. Comprehensive automated lines are the basis for these processes.

Thus, a rear wheel nave bearings welded-stamped nut is now manufactured from 14-mm calibrated rod in bales on two 400 piece/hour multipurpose automated lines in the machining flow. The new technology has replaced the previous cold punching of nut blanks from sheet steel and permitted a two-fold reduction in the labor-intensiveness of their manufacture, increasing the ratio of forgings weight to initial blank weight to 0.99 and the metal use factor from 0.18 to 0.72. The annual metal savings will be 1,400 tons and the total annual economic impact -- 200,000 rubles.

With the former technology, the rear axle housing trunnion flange was manufactured by stamping with steam hammers and subsequently cutting off the seams and punching out the metal scrap on presses. The stamping heating was done in gas-flame furnaces. The forgings were subjected to furnace normalization, shotblast cleaning and machining on eight six-spindle semiautomatic lathes. Using the new technology developed at the plant, the flange is manufactured from 33-mm hot-rolled 20 steel chopped blanks. The technological process (Figure 1, following page) consists of milling the blank ends as the bevel is removed, cold-bending the ring thrust blank, automatic arc welding of the ring thrust blank butt while forcing the seam into shape, induction heating of the ring thrust blank for stamping, no-seam high-precision flange stamping and final (slight) machining of the flange, including reaming the opening, removing the bevel and trimming the collar butt.

Two multipurpose automatic lines (a.c. No 804136, USSR) were designed, manufactured and introduced into production to effect the new technological process for manufacturing the rear axle housing trunnion flange. Each line (Figures 2 and 3, following page) includes a loading device (5), a bilateral machine tool (13) for

### Figure 1. Technological Process for Obtaining Blanks



**Key:**

- Initial blank
- Blank after machining
- Blank after bending
- Blank after welding
- Flange after stamping
- Flange after machining on the line

**Figure 2. Overall View of the Automatic Line**

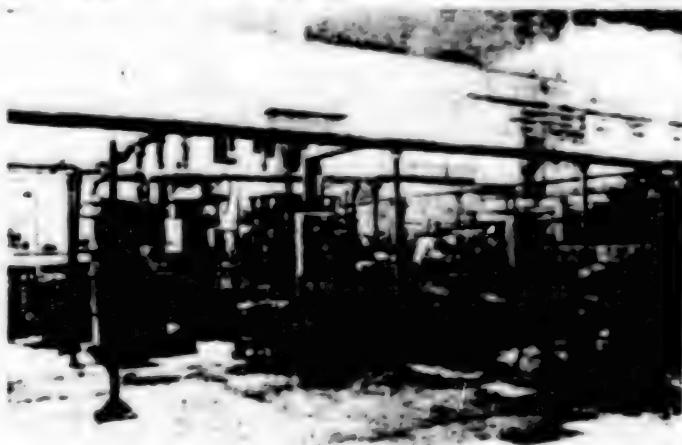
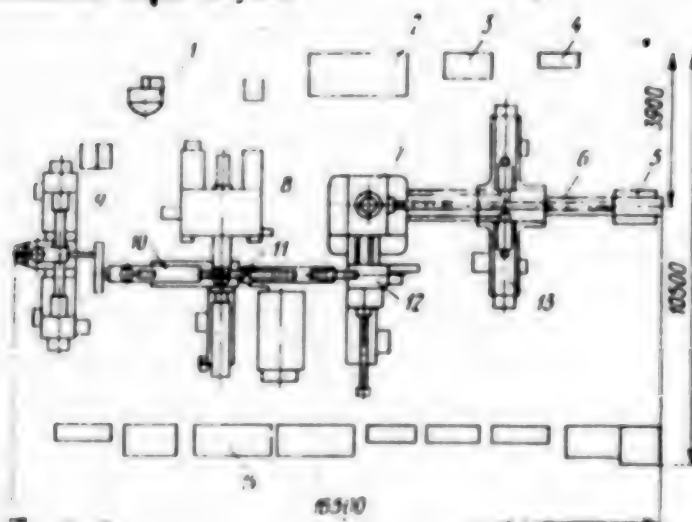


Figure 3. Automatic Line Layout



milling blank ends and removing bevels, a hydraulic press (7) for bending the ring thrust blank, a welding installation (12), an induction heater (11), a flange stamp (8), a cooling chamber (10) and a machine tool (9) for machining the flange. Moreover, there are transport mechanisms (6), high- and low-pressure hydraulic stations (2 and 3), high-frequency current sources (14), control panels and cabinets (4), and also a tank for preparing the water-graphite lubricant (1).

The loading device is a hopper into which measured rolled blanks are put; they contain a turner and a device for feeding blanks one at a time onto the transport mechanism. The hopper has a capacity of 200 blanks, ensuring operation of the line for more than an hour.

The hydraulic press (a.c. No 772656, USSR) for bending the ring thrust blanks develops a maximum force of 1,360 kH when the slide block travels down and 920 kH when the slide block travels up. Maximum press slide block speed going down is 40 mm/sec and maximum speed going up is 60 mm/sec. The press design eliminates load nonconcentricity relative to its axis when bending the ring thrust blank.

The mechanism for transporting the blank from the loading device (5) to the press (7) for bending has a device for lubricating the blanks before bending (immersion in the oil tank) and a device for monitoring the length of the blanks before milling.

A bilateral machine tool (13, Figure 3) is situated near the transport mechanism for milling blank ends and removing bevels. The machine tool is equipped with a device for basing the blank lengthwise and a pneumatic-lever device for clamping the blank for machining. This machine tool uses normalized two-speed power reserve mechanical drive tables and milling headstocks installed on the table. The blanks are machined by a cutting heads with hard-alloy blades and a drill which makes conical production openings in the blank ends to facilitate hard-alloy blade work when milling butts. The power table working feed speed is 33.8 mm/min and the spindle rotation speed is  $500 \text{ min}^{-1}$ .

The welding installation (12) contains detachable cooled copper forms which cover the ring thrust blank seam zone and which also have a slit for the welding rod to pass through. The automatic arc welding is done by a type ADS1000-5 automatic machine. The welding installation also contains a spool for the welding wire, a system for feeding carbon dioxide to the welding zone and a system for blowing slag off the forms.

The installation enables us to weld ring thrust blanks with nonparallel seams.

The induction heater (11) is equipped with a pneumatic lift and push rod, as well as stationary [sklizami] and a smothering device. It is fed from a TPCh-250-2.4 thyristor frequency transformer ( $N=250 \text{ kW}$ ,  $\omega=2400 \text{ Hz}$ ). Two transformers are installed on the line, one being a reserve.

The flange stamp contains a type K0036 offset-lever press for cold extrusion at 6300 kH (manufacturer, Gor'kiy Motor Vehicle Plant) and a closed stamp which ensures high-precision no-seam parts stamping on a central mandrel rod, its ejection from the die and removal from the plunger die and mandrel rod. The

stamp also has a system for feeding the dispersed water-graphite lubricant onto the tool and cooling the tool with a spray of water.

The cooling chamber (10) contains a [skliz] and sprayer. It is connected to the exhaust ventilation system.

The machine for machining the flange (9) has cutting heads with hard-alloy blades. The operating feed speed during reaming is 134 mm/min and when notching the butt -- 20.8 mm/min; spindle speed of rotation is  $160 \text{ min}^{-1}$ .

The productivity of the automatic line when manufacturing a motor vehicle rear axle housing trunnion welded-stamped flange is 150 parts/hour at 100-percent load; its dimensions are 16,500 x 10,500 x 5,150 mm and its installed capacity is 700 kW.

Thanks to the fact that we succeeded in putting this line in the mechanical assembly shop and because it fully automates the processes, the plant now has available to it continuous flow-line production of welded-stamped ring-thrust form parts which combine the processes of machining, cold and hot pressure working, welding and heat treatment. The flanges reach the automatic line by conveyor for welding to the trunnion and for subsequent machining.

Introduction of the new technological process for manufacturing welded-stamped flanges on multipurpose automatic lines has enabled us to:

- lower metal expenditure per part, increase the metal use factor from 0.55 to 0.87 and achieve a metal savings of more than 1,000 tons per year;

- raise labor productivity and reduce flange machining labor-intensiveness by 17,000 norm-hours per year;

- reduce the amount of machining, reduce losses to shavings from 0.7 kg when machining on automatic lathes to 0.094 kg when machining on automatic lines, freeing eight sic-spindle semiautomatic model 1284's for other work;

- reduce flange weight at the trunnion welding point by 18 percent and, in so doing, reduce the amount of machining after welding flange and trunnion;

- take flange manufacturing out of forging production and, in this regard, free space and capacities to produce 2,700 tons of forgings per year;

- reduce transport expenses.

The overall economic impact of introducing the line has been 150,000 rubles per year.

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## OTHER METALWORKING EQUIPMENT

### COMPENSATION MECHANISM FOR MASTERING NEW EQUIPMENT

Moscow FINANSY SSSR in Russian No 7, Jul 82 (signed to press 11 Jun 82 and 17 Jun 82) pp 28-32

[Article by Candidate of Economic Sciences G. A. Tsaritsina and Ye. B. Mukhanova under the heading "Finances and Scientific-Technical Progress": "Several Questions of Improving the Compensation Mechanism for Mastering New Technology"]

[Text] Updating equipment, retooling all branches of the national economy -- this is the decisive condition for changing the economy over to primarily an intensive path of development. The rates of equipment renewal are increasing approximately 1.5-fold in the 11th Five-Year Plan. This demands the creation of economic conditions most favorable to enterprises mastering the production of new equipment. In fact, it is at precisely this stage of scientific and technical progress that scientific and technical achievements are materialized and the link between science and production is concretely embodied. L. I. Brezhnev emphasized in the Accountability Report to the 26th CPSU Congress: "The decisive and most critical sector today is the introduction of scientific discoveries and inventions."<sup>1</sup>

The creation of appropriate economic conditions for enterprises mastering the production of new equipment means intensifying their economic interest and stimulating the introduction of scientific-technical achievements, an important direction in improving the mechanism for managing scientific-technical progress.

L. I. Brezhnev spoke of shortcomings in operation of the management economic mechanism at the November (1981) CPSU Central Committee Plenum: "The Congress has proclaimed the slogan 'The Economy Must Be Economical'. The entire economic mechanism must be brought into accord with this demand. But it must be acknowledged that this has thus far not been done properly. It is for precisely this reason that one must still encounter economic situations in which it is economically disadvantageous for enterprises and associations to choose taut plans and force scientific-technical progress...."<sup>2</sup>

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<sup>1</sup>"Materialy XXVI s"yezda KPSS" [Materials of the 26th CPSU Congress], Moscow, Politizdat, 1981, p 43.

<sup>2</sup>KOMMUNIST, No 17, 1981, p 10.

The 26th CPSU Congress set the concrete task of creating economic conditions for enterprises mastering scientific and technical achievements and improving the economic mechanism at that level: "It is necessary that everything making the process of introducing innovations laborious, slow and painful be eliminated. Production must be vitally interested in the fastest and best utilization of the fruits of the thought and labor of scientists and designers."<sup>1</sup>

The period in which the production of new equipment is mastered is a time during which the equipment passes through the basic stages of mastering, reaches designed indicators, is transformed from a loss item into a profitable item and begins yielding not only a national economic, but also a cost accounting impact. It includes: scientific research and experimental design work, the design of fittings and tools, manufacturing prototypes, prototype testing, reworking and adjustment (at customer request), preparing production for the (large- or average-series) industrial release of the new equipment, release of the first prototype-industrial series, and the start of series production of the new equipment. All these stages have specific features demanding special consideration in the economic mechanism system, in the compensation mechanism.

The process of mastering the production of new equipment (MPNE) influences enterprise economics. There are general features of this influence which are characteristic of all enterprises. As is known, MPNE demands large preliminary expenditures. Moreover, there is a definite risk, inasmuch as these expenditures are not always recompensed. But even in the most successful instance, expenditures on mastering and the impact of the new equipment do not always coincide in time and place.

During MPNE, the enterprise diverts labor and material resources from the production of highly profitable output and sometimes decreases production of it, leading to a deterioration in economic indicators for basic production activity and reduced economic incentives funds, placing it in worse economic conditions as compared with those enterprises not mastering new equipment. Resolving this problem requires the creation of an economic mechanism which will ensure compensation for the increased mastering expenditures and eliminating the negative influence of MPNE on the economic status of the enterprise. The creation of special economic conditions and intensified economic stimulation of enterprises during the MPNE period depend largely on how well adjusted the compensation mechanism is.

There are also specific features of the mastering process at each individual enterprise which must be taken into account when working out a comprehensive system of measures to stimulate MPNE in practical administration. In order to do this, in our view, it is appropriate to classify enterprises using criteria whose basis must be the specific difficulties of mastering and to work out possible ways of eliminating them.

The compensation mechanism must take into account delimitation of the types of new equipment being mastered, their production features and, in this connection, anticipate various approaches to stimulating it. There exist three basic types

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<sup>1</sup>"Materialy XXVI s"yezda KPSS," p 43.

of equipment updating: a) mastering the production of fundamentally new equipment; b) releasing new modifications; c) modernization.

Recently, enterprise and branch five-year and annual plans have contained in the exact same line an assignment on mastering the manufacture of so many items of new machinery or substantially modernizing others. This approach has found reflection in stimulation as well. Thus, the state Badge of Quality is awarded to and price surcharges are set for equipment models developed previously but of improved quality parameters (reliability, durability, operation) which provide a great savings. Thus, prices stimulate the creation of equipment needed by society if it is highly efficient and economical.

It is critical today that we stimulate the creation of fundamentally new equipment whose development has become possible thanks to the birth of new directions in scientific research. This applies, for example, to robots in machinebuilding, machine tools to work parts using light (lasers), and others. Fundamentally new equipment generally does not yield its maximum economic impact right away, as its area of application is initially very limited, and the result grows as it extends throughout the national economy. When mastering the production of such equipment, the risk factor is high, expenditures are high and schedules are long, but, if successful, a significant national economic impact is realized. In this instance, economic stimulation must be intensified and the compensation mechanism must assume higher expenditures, longer schedules and a high degree of risk. In other words, the creation and mastering the production of fundamentally new equipment has specifics which must be taken into account by the stimulation mechanism.

Inasmuch as fundamentally new equipment satisfies certain national economic requirements, its effectiveness must be taken into account. Mastering its production in industry must be stimulated as a function of that effectiveness, which must be reflected in setting prices. The profitability of fundamentally new equipment must be higher than for less-effective traditional equipment.

After mastering a certain model of fundamentally new equipment, the enterprise continues to produce it for a number of years and then begins manufacturing improved models based on it but with better operating parameters (automatic or precision machine tools, for example). In this instance, risk and time involved in mastering decrease, there is no need for retooling and renovation, and basic production is not stopped. The new and improved models are produced in parallel, based on existing equipment. Changes in technology are also insignificant, that is, the MPNE process is simplified and made easier. Correspondingly, stimulating it should also be done in lower amounts and the stimulation must be more short-term in this instance, since the expenditures it needs to cover are significantly lower and the impact from them is obtained faster. This also relates to modifications broadening or narrowing the sphere of application of a given model through various special attachments (as, for example, a machine modified for export to the tropics). The release of such equipment is basically stimulated through special price surcharges.

Modernization must be discussed as applicable to technology and to particular machines.

Technology modification signifies that a previous model has been withdrawn from production and a new model is being manufactured instead, but with the same technical purpose and performing the same production functions, simply improved and more productive. Consumer enterprises dismantle the old machine and put a new one in its place if it ensures them a savings in aggregate labor expenditures. In this instance, the manufacturing enterprise takes even less of a risk. The principle of technology modernization must be to make as few changes as possible and with the greatest impact possible. The fewer the changes in technology, the greater the economic interest of the enterprise. This means the amounts of economic stimulation in this instance must also be even lower than when mastering the production of fundamentally new equipment. Practice has shown that the bulk of the technology being mastered by enterprises goes to modernization, which is precisely what they are more willing to produce in connection with that greater economic interest.

Modernization as applicable to particular machines means the replacement of individual elements after a certain period of operation with improved elements (as, for example, the replacement of machine tool subassemblies and parts by a plant repair service). Such modernization is not very efficient.

In all three cases, the stimulation must be different, for expenditures are dissimilar for designing, adjusting, planning and developing fittings and tools, installing equipment, and duration of the mastering period. One can thus speak of the features of the compensation mechanism of economic stimulation in relation to fundamentally new equipment, modifications and modernization.

In practice, and particularly in the enterprise new equipment plan, it is not subdivided into these three types. This plan indicates the name of the item, a brief technical description of it, the number of author's certificates (or applications) being used, the basic stages and schedules for doing the work and the level of production. This information is inadequate and is not always presented in a form convenient to analyze. In our view, in order to increase the effectiveness of the compensation mechanism, it is appropriate to set aside a special plan section for each of the enumerated types of new equipment. Moreover, it must take into account the levels and sources of financing for MPNE work.

The new equipment plan takes into account only the initial stages of mastering (planning, design, manufacture and finishing work on prototypes). The last work stage reflected in the plan includes the manufacture either of an experimental lot or a reference series (differing at different enterprises) but, in any case, the reference is to releasing a few units. As soon as the period covering the first year or two of industrial, series production of the new equipment begins, it is immediately included in the plan for mastered output. The exact same levers and incentives are applied to it as are applied to items long in production. This is, we feel, incorrect.

As is known, new equipment is often loss-producing during the entire mastering stage; its profitability for the enterprise manufacturing it is generally lower and labor intensiveness is generally higher than for old output. And it is only after a certain period of large-series production has passed that it becomes economically profitable for the producer. It is therefore precisely during the mastering period that the most attention must be paid to creating conditions which will increase the economic interest of enterprises in this process.

The gap noted in stimulating the mastering of new equipment also has other negative aspects. The eventual fate of the prototypes and reference series is not reflected in the enterprise new equipment plan. What became of the prototype? Did it reach series production or not? What technical resolutions were made the basis of other types of new equipment? What did manufacturing the new model cost the state? The new equipment plan provides no answers to any of these questions, much less do the data on actual plan fulfillment. Thus, the existing system of reporting new equipment plan fulfillment provides no opportunity for effectively stimulating enterprises to master the production of new equipment.

Of course, setting up such record-keeping properly and properly monitoring new equipment plan fulfillment is complicated. It requires close coordination of the activity of various plant services. Moreover, consideration should be given to the large number of enterprise new equipment plans (often several dozen models). Finally, it should be stated that it is practically impossible to obtain a complete picture of outlays on mastering new equipment at the enterprises. One reason is the lack of centralized, detailed record-keeping on and monitoring of the entire mastering process.

In our opinion, primary attention should be focused on detailing the new equipment plan. Managing the mastering process should be based on a concrete model which should be used for comprehensive planning, financing and economic stimulation.

Expenditures on mastering the production of new equipment are currently recompensed basically through net cost and the unified science and technology development fund. There are also other sources for recompensing outlays such as the production development fund and credit, but they do not play a substantial role in overall expenditures.

Machinebuilding enterprises are interested in manufacturing innovations only when they can recompense expenditures fully and on time. Unfortunately, we are not succeeding in solving this problem through price surcharges for quality and the unified science and technology development fund. In a number of instances, new equipment turns out to be unprofitable for both producers and consumers. The faster the release of output previously produced grows, the better the enterprises' management indicators are and the higher the incentives funds and bonuses. But the creation and mastering of new equipment does not exert a direct influence on the rates of increase in production volume, profit and profitability.

In our view, practical use must be made of the provision in accordance with which price surcharges for efficient new equipment must be set not after certification (which is generally done in the second or third year of series production), but right away, when it is first mastered. One would think that the certification itself should be done not simply by comparing a given model with the most improved models in that group of equipment, but by comparing it with the most productive and efficient types of equipment in use in its sphere of application.

The awarding of the Badge of Quality, setting whole price surcharges and other forms of incentive in effect with regard to output in the highest quality category

must also be used with consideration of the demands being made on the equipment in a specific sphere of application. For example, equipment which is as universal as possible (that is, which ensures the manufacture of the largest number of a variety of parts possible) is required for poorly specialized shops and for shops in which individual production predominates; they must possess sufficient precision and reliability while at the same time being relatively inexpensive. If new equipment meets these demands and in the aggregate surpasses existing analogous models, it deserves to be awarded the Badge of Quality and appropriate forms of stimulation should be used. As concerns new equipment for mass production, it must ensure the highest labor productivity and must be very reliable. At present, all these important factors are taken into account by no means fully in economic planning work. It is therefore appropriate to supplement the existing Production-Technical Output Certification Regulations (in this instance, production equipment) by refining the set of analogs for comparison.

In our view, these supplements must be as follows. The technical level of new equipment must be evaluated and it must be awarded an appropriate quality category based on the requirements of a concrete sphere of application on the basis of comparison with the best types of equipment in use in that particular sphere. The wholesale price for new equipment should be set with consideration of the effectiveness of using it not under the average conditions in all branches of the national economy in which this particular equipment group is used, but based on its effectiveness in a specific sphere of application.

The profitability norm for efficient new equipment must be set higher than for mastered output, and it must be especially high for fundamentally new equipment.

Price-formation problems must not be viewed abstractly, divorced from analysis of the basic trends in developing the equipment itself. For example, one can trace in world machinebuilding a trend towards constantly increasing the fleet of numerical preset-control (NPC) machine tools which permit a sharp increase in labor productivity. In our country, the fleet of such machine tools has been growing especially fast in recent years. The "Basic Directions of USSR Economic and Social Development in 1981-1985 and Up To 1990" anticipate a significant increase in the productivity of machine tools, which can be ensured only by releasing more progressive equipment, and NPC machine tools in particular. For example, "Krasnyy proletariy" machinebuilding production association imeni A. I. Yefremov will have changed over completely to releasing such machine tools by the end of the 11th Five-Year Plan, which, given a slight increase in equipment production volume, will ensure 1.5-fold productivity growth.

Moreover, as the production of NPC machine tools increases, a striving to combine them into sectors and create comprehensively automated machine-tool systems (CAMS) becomes evident. Automated warehousing transport, data provision and control using computers are characteristic of these systems. Such trends in machine-tool manufacturing development naturally lead to a significant increase in the cost of new equipment, which is connected first of all with the higher amount of electronics used. And this must also be taken into account by the management mechanism and the system of compensating for higher mastering expenditures. For example, the share of semifinished products and purchased assembly components in the net cost of NPC machine tools produced by the "Krasnyy proletariy" is 74-82 percent.

It should also be noted that the use of electronics in machine tools has required an increase in electrical equipment complexity, in the number of parts and subassemblies and in labor intensiveness, and it has also led to an increased amount of start-up and adjustment and other work.

In our opinion, we need to stimulate a reduction not only in the enterprise's own expenditures, but also in the cost of purchased semifinished output and items for which the rates of reduction are significantly lower than for other full net cost items. One example would be the net cost of "Krasnyy proletariy" production complexes consisting of machine tools and an industrial robot.

The net cost of an industrial robot equals or exceeds the net cost of two machine tools. However, the effectiveness of using such robots has been proven in practice, foremost for heavy physical work. The use of robots corresponds to a promising new direction in machine-tool manufacturing, the creation of NPC machine tools requiring limited servicing.

The increased prices for new equipment basically reflect an increase in the labor-intensiveness of their manufacture. Such equipment is highly productive and efficient. It is therefore very important that the increase in prices be accompanied by a reduction in expenditures per unit of useful impact. In our view, improving the parameters of new equipment is not an end in itself, but must be closely connected with the requirements of its sphere of application, with the entire technical and technological production complex. Moreover, equipment being mastered often has additional advantages not comparable to those of the equipment being replaced -- expanded sphere of application and others.

The functioning of the MPNE expenditures compensation mechanism depends largely on the formation and use of a unified science and technology development fund. All mastering outlays cannot be recompensed using just the price-formation mechanism, as new equipment prices would be very high in that case.

It should also be noted that an enterprise mastering new equipment can never be completely confident that the model will enter series production. Mastering a new item sometimes ends with the production of one or several prototypes. Large sums are spent on creating them.

The question arises of how to reimburse enterprises for high expenditures on mastering the production of new equipment, including those on creating all prototypes, if consideration is given to the fact that the basic function of the MPNE process is to search out technically improved, more economical and reliable resolutions. And searching is, as was already stated, always connected with risk. Society must therefore reimburse the enterprise for all socially necessary expenditures on creating new equipment. To this end, the unified science and technology development fund must be used along with the price system.

The most important task which must be resolved using the unified science and technology development fund is to finance scientific research, experimental design and technological work and to reimburse expenditures connected with the creation and mastering of new types of output and the higher expenditures in the first years of its production. The CPSU Central Committee and USSR Council of

Ministers decree No 695 of 12 July 1979 anticipates that the cost of industrial-type work associated with the mastering and introduction of new equipment and that done through the unified science and technology development fund must be taken into account in the total output volume, calculating normative profit for corresponding groups of items.<sup>1</sup> Unfortunately, this procedure has thus far been used very rarely in practice.

The enterprise is basically reimbursed from the USTDF [unified science and technology development fund] only for the difference between the single-unit price and the series-production price. But this output is included in the report at series-production prices, which are often nearly twice as low as single-unit prices. This same procedure is used relative to wholesale lots. And only mastering expenditures for certain small-series models are financed in full. This is to be explained by the inadequate overall USTDF amounts.

In our opinion, therefore, USTDF funds must be increased when improving the mechanism for reimbursing higher expenditures at enterprises mastering new equipment. Today, a significant portion of the higher initial outlays on mastering incurred by the manufacturing enterprise is related to the net cost of new items due to the inadequate amounts of these funds, increasing the price of the items and making it harder for the consumer to introduce them. Increasing USTDF funds would enable us to reimburse temporary profit losses for enterprises manufacturing new equipment using branch funds.

It is important to establish an optimum relationship between USTDF funds for scientific research and expenditures to meet the needs of industrial MPNE. Since the USTDF has replaced the previous new equipment mastering fund, the targeting of these various expenditures has disappeared. No strictly scientific basis has been worked out for this division. In practice, the bulk of the funds are often spent on scientific research and a lesser portion are spent on manufacturing and testing prototypes.

This relationship would not seem to be justified. We need to work out and institute scientifically substantiated normatives for distributing expenditures by work stage as the direct development of new equipment in the sphere of material production is in fact the most important, concluding stage of scientific and technical progress.

USTDF funds must be spent exactly as intended, that is, only for MPNE. At the same time, they are often used to award bonuses to workers. These funds are sometimes spent to prepare for the production of new equipment. It should be remarked that there are thus far no special resources the enterprises must use to prepare for the production of new equipment. Each operates at its own risk and on its own responsibility.

We need to precisely determine the sources of financing and procedures for recording expenditures on preparing for the production of new equipment and on stimulating this work. In our view, such expenditures must be financed basically through the production development fund, since they are in the final analysis

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<sup>1</sup>See: "Sovershenstvovaniye khozyaystvennogo mekhanizma" [Perfecting the Economic Mechanism], Moscow, 1980, p 28.

directed towards raising the technical level of production. It is therefore appropriate that they be excluded from the USTDF. It can then be used more fully to meet the direct needs of developing science and technology, updating and improving the quality of the output being released.

What is to the advantage of the national economy and the branch must become advantageous for each collective producing and introducing efficient new equipment. Solving this problem is one of the most important tasks of perfecting the compensation mechanism. The approach to its resolution must be comprehensive. Planning and setting the prices for new equipment, the use of price surcharges and the procedure for forming and using the USTDF must be improved simultaneously and in a coordinated manner.

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## OTHER METALWORKING EQUIPMENT

### RYAZAN' PLANT DEVELOPS SEMIAUTOMATIC LATHE - ROBOT COMPLEX

Moscow EKONOMICHESKAYA GAZETA in Russian No 17, Apr 82 (signed to press 19 Apr 82) p 16

[Article under the heading "Technical-Economic Information": "An Automatic Manipulator Becomes Part of the Complex"]

[Text] The "machine tool - automatic manipulator" lathe complex machines parts with great precision. It was developed by the Ryazan' Special Design Bureau. The complex includes an industrial robot which feeds blanks into the semiautomatic machine tool following a prescribed program, mounts them and, after the part has been manufactured, places it in packing.

This manipulator is equipped with guidance elements. There is no need to prepare a control program. The speed with which the semiautomatic lathe can be set up for a different type-size part has increased. The economic impact exceeds 23,000 rubles per year.

As the special design bureau reported, we plan to produce the "machine tool - automatic manipulator" lathe complex at the Ryazan' Machine-Tool Manufacturing production association.

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## OTHER METALWORKING EQUIPMENT

### GOSSTANDART IMPOSES FINES FOR SUBSTANDARD OUTPUT

Moscow EKONOMICHESKAYA GAZETA in Russian No 22, May 82 (signed to press 24 May 82) p 9

[Article: "Economic Sanctions"]

[Text] Gosstandart [State Committee for Standards] agencies have imposed economic sanctions against a number of enterprises for producing output deviating from standards.

The Dmitrovsky Milling Machine Plant (Ministry of Machine Tool and Tool Building Industry) sold vertical milling and cantilever machines not in conformity with the specifications of TU 2-024-5120-79. In this connection, 920,000 rubles was excluded from its reports on production volume plan fulfillment and 71,200 rubles in profit was withdrawn to state budget revenue.

At the Tuchkovo "VNISTroyopolimer" experimental enterprise (USSR Ministry of Construction Materials Industry), 740,000 rubles was excluded and 58,600 rubles in profit was withdrawn for releasing PVC linoleum on a fabric underwarp not in conformity with the specifications of GOST [All-Union State Standard] 7251-77.

Some 479,800 rubles was excluded from reports for "Sibelektroterm" production association (Ministry of Electrical Equipment Industry) for selling SDO-25, 90,18/7-11 electric furnaces not in conformity with the specifications of TU ONNN538000-78; 344,000 rubles was excluded at the Kabardino-Balkarskiy Diamond Tool Plant (Ministry of Machine Tool and Tool Building Industry).

For releasing pure-wool yarn article 1910 and 2210 in violation of the specifications of GOST 17511-72, some 188,500 rubles was excluded from the report of the Chernogorsk Worsteds Production Association (RSFSR Ministry of the Textile Industry) and 20,900 rubles in profit was withdrawn to state budget revenue; for Faleshtskiy Tobacco-Fermentation Plant (USSR Ministry of Food Industry), 121,500 rubles was excluded and 13,700 rubles in profit was withdrawn to state budget revenues and sales of all products are prohibited.

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## OTHER METALWORKING EQUIPMENT

### GOMEL' EFFICIENCY SPECIALIST PRAISED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 11 Jun 82 p 2

[Article under the heading "Innovator and Five-Year Plan" by design engineer V. Bondarenko, chairman of the All-Union Society of Inventors and Efficiency Experts council at the Machine-Tool Building Plant imeni S. M. Kirov (Gomel'): "Not For Honor's Sake"]

[Text] You won't know everyone at a large plant well. Some you encounter once in a while in your work, others you may sit next to at a meeting, others still you may only see... So, although you say hello to these people, you don't know anything for sure about them. And when you do get to know them better, you are embarrassed that you weren't able to see before that they were interesting people.

That was the case with Kurdyumov. For years, we nodded to each other in passing, but I only knew his name was Petr Mikhaylovich and that he was an engineer in the tool department. Modest. Taciturn. Too little to judge a man on.

Then, in the plant management smoking room one day, the discussion turned to efficiency specialists (the second-choice topic, following sports, among technologists and designers during smoke breaks). Someone maliciously said, "I wonder if there would be even one efficiency expert left at the plant if they stopped paying for proposals...."

But the answer was unexpectedly serious: "There would. Kurdyumov there, for instance...."

And then I heard this story. There were not enough abrasive tools at the plant for a month straight once. The shops were getting impatient. Kurdyumov got the idea of impregnating the discs with bakelite. The technology turned out to be complicated. A number of subtle refinements were made after many trials and errors. The results exceeded all expectations: the durability of the tool was increased 1.5- to two-fold! The proposal was introduced and the news flew through the enterprises of Gomel'.

Petr Mikhaylov was invited to share his experience. After success like this, one would think an efficiency proposal should be drawn up right away. But Kurdyumov didn't want to. He made solution containers and dreamed up attachments to make the bakeliting process easier in his spare time. He did this difficult

and dirty, in the full sense of the word, work himself for a long time. But when the BRIZ [bureau of efficiency improvement and inventions] engineer reminded him about drawing up a proposal, he said, "Something else to worry about. Let somebody else do it...." And that's what happened; his co-authors drew one up.

I have been watching this energetic man since then. He's smart, like a hockey referee. I was fortunate to have the following opportunity. Shop No 8 for assembling special machine tools was put into operation and Petr Mikhaylovich was asked to be the production preparation engineer there. He knew the work was worrisome and demanding, that there would be no business trips, and that was a factor of some importance, as a war wound was giving him increasing concern. My machine tools were among those periodically assembled in "number eight," so I began meeting Kurdyumov frequently.

Soon the news spread through the plant that Kurdyumov would be testing his "lookout tower." As soon as I stepped into the shop I saw it, a tripod almost as high as the crane track. In the top cage was an electric hoist and under it, something like torpedos. All around were curious people, each trying to get as close as possible to see better how the pood [36-lb] cams would be seated on the end. I'll admit I was most confused by the "torpedo." It was connected by a hose to the pneumatic system. Clearly a device for press-fitting the cams. But since when could pneumatic cylinders the diameter of a small teacup saucer develop a force of several tons? Who had ever seen a power unit free-hanging on a cable do this kind of work?

Then Kurdyumov looked questioningly at Bazhenov. Vladimir Mikhaylovich had been through as much as the developer of the device. As expeditor engineer, he had helped Kurdyumov with the calculations, and as deputy shop chief, he had helped with materials. Nodding at the tripod, he asked, "Take off?"

No need," said Kurdyumov. "Let's start."

An automatic line ripped apart the silence of the assembly shop, and in an instant everyone could see the steel cam was in place on the shaft journal. It was so sudden that it seemed Petr Mikhaylovich himself didn't understand what had happened. He let out his breath and straightened his tie, which didn't need it. Taking a well-traveled felt cap off his head, he wiped his brow and said, "So, that's it...."

Several fitters immediately jostled their way towards him: "Explain why you jury-rigged this thing together."

Kurdyumov was even more embarrassed, coughed into his fist and explained: "Because this is a pneumatic punch for making underground wells. In nonliquids, on paper...."

Kurdyumov came to the Gomel' Machine-Tool Making Plant imeni S. M. Kirov almost three decades ago. He began as an apprentice milling-machine operator and was a boring-machine operator. He graduated from the tekhnikum night school. A bright, hard-working lad, he was invited to join the tool department as an engineer. He was immediately drawn towards improving whatever he encountered in the course of his job. He dealt most with technological fittings and studied them thoroughly.

But is knowledge, however thorough, sufficient by itself to make an innovator? Is it enough to be able to do everything with one's own hands, to be able to analyze production processes and loosen "bottlenecks"? True, these are all important components of technical creativity. Still, in observing Kurdyumov, I came to the conclusion that technical creativity is foremost a spirit, a combination of feelings and thoughts enabling one to choose from among numerous resolutions precisely the needed one at the needed moment.

I should like to repeat: it is not a matter of knowledge, but of feelings. And it seems to me that it is feelings that predominate in Kurdyumov. He is completely ingenuous and takes a child-like pleasure in knowing how to do things. Noticing that I was interested in his innovations, he didn't even ask why. He smiled and diverted my attention to a sector where his clamps were being used to transport electric panels. And he transmitted this spontaneous happiness of a person unspoiled by honors to me by some kind of telepathy. And I, already fascinated by him, jealously watch to see if the workers aren't looking askance at him, laughing at him as they watch him clumsily search under the reels for the multicolored cord to his attachment.

No, they aren't looking askance or laughing. Here comes I. Fabrikant, chairman of the plant innovators council, approaching him with a friendly smile. Someone suggests Petr Mikhaylovich demonstrate the operation of the clamps on a just-assembled electrical panel, a metal sheet with electrical apparatus and even rows of colored conductors. A glance at the side reveals a brightly colored placard which a single person would be unable to mount onto the electrical cabinet. It would strip the skin off your fingers. But when the clamp appeared, the work was made considerably easier. Electrician V. Romanov, seeing the creator of the attachment himself use it without any skill whatsoever, gently moved Kurdyumov aside and easily threw the clamp cable onto the hook of the electric hoist. Raising and securing the attachment with a trained hand, he said, "Like that, Petr Mikhaylovich, or have you already forgotten how?"

He put his work table in the tool storeroom. You leave his "office" and the shop is right there. Three steps from the storeroom our new output, a multiple-program NPC drilling and milling machine, is being assembled. Petr Mikhaylovich has already proposed quite a few attachments for assembling them, and what attachments they are! It was for good reason that people were once openly envious of Bazhenov: you're lucky, they said, you have Kurdyumov. Yes, he grinned, he's not bad. As the person responsible for work with innovators in the shop, Bazhenov worships Kurdyumov. And at the same time, when no longer speaking formally, he explodes: "Pray you never get such an efficiency expert! Hell could freeze over before you get him to write an application for a proposal which has already been put into production."

The deputy shop chief's concern is understandable: technical creativity socialist competition results are summed up quarterly at the plant. Petr Mikhaylovich, however, has his own view: "I won't feather my head with every petty matter." For him, the main thing is to see. The recognition of those who work alongside him is something else.

Another incident comes to mind. The plant was instructed to cooperate in supplying the "Gomsel'mash" association with a subassembly for a self-propelled

fodder harvester. Aware of the honor this assignment meant, the Kirov workers obligated themselves to have the subassembly be certified with the Badge of Quality quickly. But when they set out the measures to carry out what they had planned, an unhappy picture emerged: a great deal of time would be required for all this. The bulk of it would have been taken up by designing and manufacturing the assembly fittings, without which good quality could not be guaranteed.

Petr Mikhaylovich's intuition as an experienced production worker and innovator suggested that everything is not immediately taken into account in a complex matter, that somewhere there were reserves. He became a regular visitor to the subassembly assembly sector. He tried pressing bearings, driving bushings into housings and pouring in lubricant himself. He adjusted the balance on several pulleys. Finally, the day came when Kurdyumov knew precisely what needed to be undertaken so that these operations would ensure high quality and productivity.

The whole shop was aware of Kurdyumov's concern. The first to approach him was the electrician mentioned before, V. Romanov, for whom he had at one time made clamps in his evenings.

"Good work, Petr Mikhaylovich! If you need an electrician, you can count on me...."

Then turners, milling machine operators and fitters began offering their services. Indeed: a hundred friends is better than a hundred rubles. Soon, new devices and attachments began appearing in the sector. They were immediately christened "kurdyumovisms." The subassembly was awarded the highest quality category on schedule. Thanks to the creative thought and skilled hands of Petr Mikhaylovich, at least six months was saved. But once again, he didn't need honor. If the shop and plant got it, he was content.

I recently sought out Kurdyumov and congratulated him on his being awarded first place in the plant contest for best efficiency experts in mechanizing manual labor. I reported that the BRIZ [bureau of efficiency improvement and inventions] was preparing a placard devoted to his inventions. That should please him, I thought. But he smiled guiltily: "If you must...."

And he immediately drew me aside into his fitter's shop (which he had equipped himself in a secluded part of the shop) and began demonstrating the next project, which he had not yet given to the fitters.

"Any other ideas?"

"In this work, there are starts, but finishes...I don't know. Yes, a ton of ideas." Kurdyumov nodded towards a notebook in a brown binder.

It was dusk when we left the plant. The breeze from the Sozh was cool. We said good-bye at the streetcar stop and I asked where he was born. Surprise! It turns out we're not only from the same republic, oblast and rayon, but from the same town, one you won't find on any map.

Meeting another from your home town is always pleasant, doubly so in this case.

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